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Appendix D: Traffic Analysis

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Traffic Evaluation

In order to assess the off-site traffic impacts associated with the two sites under consideration for the commuter rail facility, existing traffic conditions have been inventoried and evaluated. Existing conditions were projected to represent the background traffic conditions expected in the build-out year of 2010. The 2010 background traffic conditions were also evaluated. Trip generation and distribution for the two sites were estimated, and traffic was assigned to the surrounding street system. The traffic operations associated with the two "build" conditions were evaluated. Comparisons were made between the 2010 background traffic conditions and each of the build scenarios. The methodology and results of the projections, analyses, and comparisons are presented in this chapter.

Existing Traffic Conditions

To assess existing traffic conditions in the project study area, an inventory of the existing street system was conducted, traffic count data was collected, accident data was reviewed, and capacity analyses were conducted at key intersections.

Inventory of Existing Street System

Figure 1 shows the project area and the two alternative commuter station sites. The "Pawtucket/Central Falls Station Site" is on the Pawtucket/Central Falls line and is bounded by Broad Street, Clay Street, Montgomery Street and Barton Street. The second site is triangular in shape, referred to as the "P&W Yard Site," and is bounded by Amtrak rail line to the north and Conant Street to the west, and lies west and north of Pine Street and Goff Avenue.

The traffic analysis for the comparison of the two sites was planned around the key intersections in the vicinity of those locations. Given the urban environment in Pawtucket and Central Falls, it is the intersections on the street system that control traffic flow and the quality of traffic operations.

For this phase of the study, traffic counts were taken and analyses conducted at a total of sixteen intersections surrounding the alternative station locations. The key intersections

The existing street conditions were inventoried on the streets surrounding the two station station sites, utilizing the key intersections as reference points. Table 1 summarizes the main characteristics of the roadways at the key intersections in the study area. The characteristics noted include type of traffic control, functional classification of the streets, adjacent land uses, parking and pedestrian accommodations.

Table 1
Summary of Key Characteristics

No.	Intersection	Functional Classifications	Primary Land Use In Area	On Street Parking	Pedestrian Accommodations
1	Roosevelt Ave & Cross St	Roosevelt Ave - Minor Arterial, Cross St - Minor Arterial	Industrial	Parking is allowed on Roosevelt Ave. No Parking on Cross St	There is no pedestrian signal equipment or pedestrian phasing at this location
2	Roosevelt Ave & Clay St	Roosevelt Ave - Minor Arterial, Clay St - Local Street	Commercial	Parking is allowed on Roosevelt Ave & Clay St.	
3	Clay St & High St	Montgomery St - Local Street, Clay St - Local Street	Residential	Parking is allowed on the High St NB approach & on Clay St No Parking on the High St SB approach	
4	Montgomery St & Clay St	Clay St - Local Street, High St - Collector	Residential	Parking is allowed on Clay St & High St	
5	Montgomery St & Barton St	Montgomery St - Local Street, Barton St - Minor Arterial	Residential	No Parking on the Montgomery St SB approach. Parking is allowed on the Montgomery St NB approach & on Barton St.	
6	Exchange St & Montgomery St	Exchange St - Minor Arterial, Montgomery St - Local Street	Commercial	No Parking on the Exchange St EB approach. Parking is allowed on the Exchange St WB approach & on Montgomery St	There is pedestrian signal equipment and pedestrian phasing at this location
7	Broad St & Cross St	Broad St - Principal Arterial, Cross St - Minor Arterial	Commercial	No Parking on Broad St. No Parking on the Cross St WB approach	There is pedestrian signal equipment and an exclusive pedestrian phase at this location
8	Broad St & Clay St	Broad St - Principal Arterial, Clay St - Local Street	Commercial	Parking is allowed on Broad St & Clay St	
9	Broad St & Barton St	Broad St - Principal Arterial, Barton St - Minor Arterial	Commercial	No Parking on Broad St & Barton St	There is pedestrian signal equipment and pedestrian phasing at this location

10	Goff Ave/ Exchange St/ Broad St/ Summer St	Goff Ave- Minor Arterial, Broad St - Principal Arterial, Summer St - Principal Arterial	Commercial	No Parking on Goff Ave & Broad St & Summer St	There is pedestrian signal equipment and pedestrian phasing at this location
11	Barton St & Dexter St	Barton St - Minor Arterial, Dexter St - Principal Arterial	Commercial	No Parking on Barton St & Dexter St	There is pedestrian signal equipment and pedestrian phasing at this location
12	Goff Ave & Dexter St	Goff Ave - Minor Arterial, Dexter St - Principal Arterial	Commercial	No Parking on Goff Ave & Dexter St	There is pedestrian signal equipment and pedestrian phasing at this location
13	Main St & Pine St	Main St - Principal Arterial, Pine St - Minor Arterial	Commercial	No Parking on Main St & Pine St	There is no pedestrian signal equipment or pedestrian phasing at this location
14	Pine St & Church St	Pine St - Minor Arterial, Church St - Minor Arterial	Commercial	No Parking on Pine St & Church St	There is no pedestrian signal equipment or pedestrian phasing at this location
15	Main St & Mineral Spring Ave	Main St - Principal Arterial, Mineral Spring Ave - Principal Arterial	Commercial	No Parking on Mineral Spring Ave. Parking is allowed on Main St	There is no pedestrian signal equipment or pedestrian phasing at this location
16	Church St & Garden St	Main St - Principal Arterial, Garden St - Minor Arterial	Commercial	No Parking on Church St & on the Garden St SB approach	

*Note: All streets have sidewalks on both sides to accommodate pedestrians

= Unsignalized Intersection

= Signalized Intersection

Bus routes in the study area were inventoried. There are twelve bus routes through Pawtucket. The primary origin/destination is the Roosevelt Avenue stop near Main Street. The bus routes are summarized in Table 2.

Table 2

Summary of Bus Routes

Bus Route	Description	Origin/Destination	Number of Stops along Route	Weekday Frequency	Saturday Frequency	Sunday/ Holiday Frequency
42	Hope Street	Hope Street/Roosevelt Avenue	7	3/hour during day	Hourly during day	1/hour during day
51	Charles Street	Charles Street/Roosevelt Ave.	7	Limited runs in peak hours	No Service	No Service
75	Dexter/Lincoln Mall	Lincoln Mall/Roosevelt Ave.	8	1/hour during day	1/hour during day	1/hour during day
76	Central Avenue	Central Avenue/Roosevelt Ave.	3	1-3/hour during day	1-2/hour during day	1/1.5 hour during day
77	Benefit/Broadway	Benefit St/Roosevelt Ave	5	1-3/hour during day	1-2/hour during day	1/hour during day
78	Beverage Hill	Kennedy Plaza/Roosevelt Ave	10	1/hour during day	1/hour during day	1/1.5 hour during day
71-99	71=Broad St, 99=Providence	Mendon Rd/Saylesville Industrial Park/Roosevelt Ave	7	1-2/hour during day	1/hour during day	1/1.5 hour during day
73	Mineral Spring	Mineral Spring Ave/Roosevelt Ave	5	1-2/hour during day	1/hour during day	No Service
79	Columbus Ave	Coutney/Roosevelt Avenue	4	1-2/hour during day	1/hour during day	No Service
80	Armistice Blvd.	Armistice Blvd./Roosevelt Ave.	5	1-2/hour during day	1/hour during day	No Service

Existing Traffic Volumes

Traffic count data was collected in the project area. Manual turning movement counts were collected at key intersections on weekdays in late May and early June of 2006. The counts were collected in 15-minute increments from 7-9 AM and 4-6 PM. A system wide peak hour was identified as 7:45-8:45 AM and 4:15-5:15 PM. The existing count data for the peak hours are shown in Figures 2 and 3 for the AM and PM peak hour respectively.

Accident Analysis

Accident data was requested from the Pawtucket Police Department and the Central Falls Police Department. The Pawtucket Police Department provided accident data for key intersections in the study area from January 1, 2003 to September 25, 2006. The Central Falls Police Department provided accident data for its key intersections for the period of January 1, 2003 to September 18, 2006. Table 2 summarizes the number of accidents that occurred at each of the intersections under review:

Table 3
Summary of Accident Data

Pawtucket Intersections	Number of accidents over last 3.75 years	Number of accidents per year
Dexter St & Goff Ave	37	10
Barton St & Dexter St	50	13
Broad St & Goff Ave	20	5
Barton St & Broad St	41	11
Exchange St & Montgomery St	11	3
Barton St & Montgomery St	4	1
Mineral Spring Ave & Main St	8	2
Church St & Pine St	21	6
Main St & Pine St	14	4

Central Falls Intersections	Number of accidents over last 3.75 years	Number of accidents per year
Broad St & Clay St	43	11
Broad St & Cross St	38	10
Clay St & High St	15	4
Roosevelt Ave & Clay St	7	2
Roosevelt Ave & Cross St	20	5

Locations with five or more accidents in a twelve-month period are typically selected for further study, as stated in the Transportation and Traffic Engineering Handbook published by the Institute of Transportation Engineers. Accident rates have been calculated for the locations with five or more accidents per year. Accident rates provide a relationship between the number of accidents at a particular location and the number of vehicles passing through that location. Accident rates for intersections are expressed as the number of accidents per million entering vehicles (MEV). Typically, accident rates greater than 1.5 accidents per MEV warrant further consideration. Table 4 summarizes the accident rates.

Table 4

Summary of Accident Rates

Intersection	Number of Accidents per year	Accident Rate (Number of accidents per MEV)
Roosevelt Ave & Cross St	5.33	1.29
Broad St & Cross St	10.13	2.28
Broad St & Clay St	11.47	1.99
Barton St & Broad St	10.93	2.15
Broad St & Goff Ave & Summer St	5.33	0.83
Barton St & Dexter St	13.33	1.84
Dexter St & Goff Ave	9.87	1.49
Church St & Pine St	5.60	1.63

As shown in Table 3, five intersections were found to have accident rates greater than 1.5 accidents per MEV. These locations include:

- Broad Street & Cross Street
- Broad Street & Clay Street
- Barton Street & Broad Street
- Barton Street & Dexter Street
- Church Street & Pine Street.

The results of the accident analysis will be useful in the next phase of the project when off-site improvements are being considered. Once a preferred

station site has been idenitified, the intersections with high accident rates will be reviewed and considered for off-site improvements if the proposed station adds significant traffic to these intersections.

Capacity Analysis of Existing Conditions

The 2006 AM and PM peak hour traffic conditions were analyzed in terms of capacity analyses. The analyses were conducted for the key intersections.

The capacity analyses were conducted using the procedures contained in the 2000 Highway Capacity Manual (HCM). The adequacy of traffic operations on any given section of roadway or at a particular intersection is expressed in terms of its "level of service." The concept of level of service is a qualitative measure describing operational conditions within a traffic stream and their perception by motorists and/or passengers. A level-of-service definition generally describes these conditions in terms of such factors as speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience, and safety.

For analysis purposes, level of service is expressed with letter designations as a range of A through F, with "A" representing the best conditions and "F" representing the worst. Level of service A can generally be described as a condition of free flow with very little delay experienced by the driver, and virtually no interference from other vehicles. Level of service F, on the other hand, is a forced flow condition, with "stop and go" traffic, excessive backups at traffic signals and undue delay and inconvenience to the motorists. Within these two extremes, level of service C represents a condition of stable operation.

Level of service (LOS) at an intersection is based on the average vehicle delay. At a signalized intersection, LOS is as follows:

LOS A - less than 10 seconds

LOS B - 10-20 seconds

LOS C - 20-35 seconds

LOS D - 35-55 seconds

LOS E - 55-80 seconds

LOS F - greater than 80 seconds

The delay range for each LOS at an unsignalized intersection is as follows:

LOS A - less than 10 seconds

LOS B - 10-15 seconds

LOS C - 15-25 seconds

LOS D - 25-35 seconds

LOS E - 35-50 seconds

LOS F - greater than 50 seconds

The results of the capacity analyses for the existing conditions are shown in Tables 5-8 with Tables 5 and 6 displaying the AM peak hour results for the unsignalized and signalized intersections, respectively, and Tables 7 and 8 showing the PM peak hour results for the unsignalized and signalized intersections, respectively.

TABLE 5
SUMMARY OF UNSIGNALIZED INTERSECTIONS CAPACITY ANALYSIS RESULTS
AM PEAK HOUR

UNSIGNALIZED INTERSECTIONS	LEVEL OF SERVICE/AVGERAGE DELAY (Sec./Veh.)			
	2006 EXISTING	2010 NO-BUILD	PAWT/CF STATION SITE	P&W YARD SITE
1. ROOSEVELT ST & CLAY ST				
CLAY ST EB	B/11.1	B/11.2	B/12.1	B/11.4
2. CLAY ST & HIGH ST				
CLAY ST EB	B/10.9	B/11.0	B/12.3	B/11.1
HIGH ST SB LEFT	A/0.3	A/0.3	A/0.2	A/0.3
3. MONTGOMERY ST & CLAY ST				
MONTGOMERY ST NB RIGHT	A/9.1	A/9.2	A/9.4	A/9.2
4. MONTGOMERY ST & BARTON ST				
BARTON ST EB	A/9.2	A/9.3	B/11.7	A/9.3
BARTON ST WB	A/9.8	A/9.8	B/10.6	A/9.8
MONTGOMERY ST NB LEFT	A/3.6	A/3.6	A/3.6	A/3.6
5. BROAD ST & CLAY ST				
CLAY ST EB	D/34.2	E/47.9	F/121.2	F/67.6
BROAD ST SB LEFT	A/8.4	A/8.6	A/8.6	A/8.6
6. CHURCH ST & GARDEN ST				
GARDEN ST SB	B/13.9	B/14.2	C/17.5	C/17.6

TABLE 6
SUMMARY OF SIGNALIZED INTERSECTIONS CAPACITY ANALYSIS RESULTS
AM PEAK HOUR

		LEVEL OF SERVICE/AVGERAGE CONTROL DELAY (Sec./Veh.)			
	SIGNALIZED INTERSECTIONS	2006 EXISTING	2010 NO-BUILD	CF/PAWT RAIL SITE	P&W RAIL SITE
1.	**ROOSEVELT ST & CROSS ST**				
	CROSS ST EB	A/8.7	A/8.7	A/8.2	A/8.7
	CROSS ST WB	A/9.8	A/9.8	B/12.3	A/9.8
	ROOSEVELT AVE NB	A/9.2	A/9.4	B/10.9	A/9.5
	ROOSEVELT AVE SB	B/10.7	B/10.9	B/12.7	B/11.6
	OVERALL INTERSECTION	A/9.7	A/9.8	B/11.4	B/10.1
2.	**MONTGOMERY ST & EXCHANGE ST**				
	EXCHANGE ST EB	A/1.2	A/1.3	A/1.1	A/2.5
	EXCHANGE ST WB	A/3.1	A/3.5	A/3.3	A/7.0
	MONTGOMERY ST SB	D/50.2	D/45.2	D/50.1	D/53.3
	OVERALL INTERSECTION	A/9.3	A/8.5	A/9.0	B/10.7
3.	**BROAD ST & CROSS ST**				
	CROSS ST WB	C/21.2	C/21.7	C/21.7	C/21.7
	BROAD ST NB	C/20.5	C/24.2	D/45.3	C/25.7
	BROAD ST SB	B/10.5	B/10.9	B/12.2	B/12.0
	OVERALL INTERSECTION	B/16.5	B/18.2	C/26.4	B/19.0
4.	**BROAD ST & BARTON ST**				
	BARTON ST EB	B/16.8	B/16.9	B/17.5	B/16.9
	BARTON ST WB	B/13.4	B/13.3	B/13.1	B/13.3
	BROAD ST NB	A/8.8	A/8.9	B/10.3	A/9.2
	BROAD ST SB	B/12.0	B/12.4	B/13.3	B/13.6
	OVERALL INTERSECTION	B/12.2	B/12.3	B/12.9	B/12.8
5.	**BROAD ST & GOFF AVE/ EXCHANGE ST**				
	GOFF AVE EB	A/9.2	B/16.1	C/33.5	B16.6
	EXCHANGE ST WB	C/28.4	D/43.2	D/54.8	D/41.4
	BROAD ST NB	E/60.8	E/61.2	E/71.6	E/74.1
	BROAD ST SB	E/70.4	D/35.7	E/76.6	F/148.9
	OVERALL INTERSECTION	D/44.6	D/41.2	E/58.0	E/66.6
6.	**BARTON ST & DEXTER ST**				
	BARTON ST EB	C/22.2	C/30.5	C/30.9	C/30.5
	BARTON ST WB	C/26.0	C/26.9	C/27.9	C/26.9
	DEXTER ST SB	A/9.6	A/9.8	A/9.9	B/12.2
	DEXTER ST NB	B/13.2	B/14.2	B/14.2	B/17.5
	OVERALL INTERSECTION	B/17.0	B/19.9	C/20.3	C/20.8
7.	**DEXTER ST & GOFF AVE**				
	GOFF AVE EB	D/36.2	C/30.6	C/27.5	C/31.4
	GOFF AVE WB	B/12.2	A/6.7	C/70.4	B/19.4
	DEXTER ST SB	D/50.7	D/45.2	D/50.9	D/53.8
	DEXTER ST NB	C/34.0	C/30.6	D/33.8	C/33.4
	OVERALL INTERSECTION	C/32.3	C/26.9	C/32.4	C/33.3
8.	**MAIN ST & PINE ST**				
	MAIN ST WB	C/23.7	C/23.6	C/23.6	A/8.4
	PINE ST NB	A/3.8	A/3.9	A/4.7	A/8.1
	PINE ST SB	A/4.8	A/5.0	A/5.2	B/13.8
	OVERALL INTERSECTION	A/5.6	A/5.7	A/6.0	A/9.3
9.	**CHURCH ST & PINE ST**				
	CHURCH ST EB	B/12.2	B/12.3	B/12.7	B/12.7
	PINE ST NB	A/7.0	A/7.0	A/7.6	A/7.6
	OVERALL INTERSECTION	A/9.6	A/9.7	B/10.6	B/10.7
10.	**MINERAL SPRING AVE & MAIN ST**				
	MINERAL SPRING AVE EB	B/16.3	B/16.4	B/16.4	C/21.7
	MAIN ST NB	A/6.9	A/7.0	A/8.0	A/9.1
	MAIN ST SB	A/8.1	A/8.5	A/8.5	B/10.9
	OVERALL INTERSECTION	B/10.6	B/10.9	B/10.5	B/15.3

TABLE 7
SUMMARY OF UNSIGNALIZED INTERSECTIONS CAPACITY ANALYSIS RESULTS
PM PEAK HOUR

UNSIGNALIZED INTERSECTIONS	LEVEL OF SERVICE/AVERAGE DELAY (Sec./Veh.)			
	2006 EXISTING	2010 NO-BUILD	PAWT/CF STATION SITE	P&W YARD SITE
1. ROOSEVELT ST & CLAY ST				
CLAY ST EB	B/13.3	B/13.5	C/21.4	B/13.9
2. CLAY ST & HIGH ST				
CLAY ST EB	B/14.4	B/14.7	E/39.6	B/11.9
HIGH ST SB LEFT	A/1.2	A/1.1	A/1.1	A/1.1
3. MONTGOMERY ST & CLAY ST				
MONTGOMERY ST NB RIGHT	B/10.0	B/10.1	B/12.9	B/10.1
4. MONTGOMERY ST & BARTON ST				
BARTON ST EB	B/10.7	B/10.8	B/13.0	B/10.8
BARTON ST WB	B/10.6	B/10.7	B/11.0	B/10.7
MONTGOMERY ST NB LEFT	A/3.7	A/3.8	A/3.8	A/3.8
5. BROAD ST & CLAY ST				
CLAY ST EB	D/26.4	E/36.0	F/102.2	E/37.5
BROAD ST SB LEFT	A/9.2	A/9.4	A/9.8	A/9.0
6. CHURCH ST & GARDEN ST				
GARDEN ST SB	C/17.1	C/18.3	C/19.2	C/19.2

TABLE 8
SUMMARY OF SIGNALIZED INTERSECTIONS CAPACITY ANALYSIS RESULTS
PM PEAK HOUR

		LEVEL OF SERVICE/AVGERAGE CONTROL DELAY (Sec./Veh.)			
	SIGNALIZED INTERSECTIONS	2006 EXISTING	2010 NO-BUILD	CF/PAWT RAIL SITE	P&W RAIL SITE
1.	**ROOSEVELT ST & CROSS ST**				
	CROSS ST EB	B/10.3	B/10.4	B/10.4	B/10.4
	CROSS ST WB	A/9.3	A/9.3	A/9.4	A/9.3
	ROOSEVELT AVE NB	B/12.4	B/12.7	B/15.1	B/13.3
	ROOSEVELT AVE SB	B/11.1	B/11.5	B/11.9	B/11.6
	OVERALL INTERSECTION	B/10.8	B/11.0	B/12.0	B/11.3
2.	**MONTGOMERY ST & EXCHANGE ST**				
	EXCHANGE ST EB	A/1.7	A/1.7	A/1.8	A/2.0
	EXCHANGE ST WB	A/2.5	A/2.7	A/2.7	A/2.9
	MONTGOMERY ST SB	D/52.9	D/52.8	D/52.8	D/52.8
	OVERALL INTERSECTION	B/14.0	B/13.3	B/13.3	B/11.3
3.	**BROAD ST & CROSS ST**				
	CROSS ST WB	C/27.2	C/28.7	C/28.7	C/28.7
	BROAD ST NB	A/9.6	B/10.3	E/64.9	B/10.3
	BROAD ST SB	B/10.1	B/11.3	B/11.6	B/11.6
	OVERALL INTERSECTION	B/14.1	B/15.1	D/37.0	B/15.2
4.	**BROAD ST & BARTON ST**				
	BARTON ST EB	B/19.5	C/20.1	C/20.2	C/20.1
	BARTON ST WB	B/13.4	B/13.4	B/13.4	B/13.4
	BROAD ST NB	B/10.4	B/10.8	B/11.4	B/10.8
	BROAD ST SB	B/14.2	B/15.4	C/24.8	B/15.7
	OVERALL INTERSECTION	B/14.1	B/14.7	B/18.6	B/14.8
5.	**BROAD ST & GOFF AVE/ EXCHANGE ST**				
	GOFF AVE EB	B/12.3	B/12.5	B/13.5	B/17.5
	EXCHANGE ST WB	C/31.3	C/34.6	D/35.9	D/36.1
	BROAD ST NB	E/57.9	E/66.7	F/102.7	F/102.7
	BROAD ST SB	E/59.5	E/66.4	F/114.3	F/115.8
	OVERALL INTERSECTION	D/43.1	D/49.1	E/76.7	E/71.5
6.	**BARTON ST & DEXTER ST**				
	BARTON ST EB	C/31.0	D/40.6	D/42.1	D/40.6
	BARTON ST WB	C/29.0	C/30.2	C/31.8	C/30.2
	DEXTER ST SB	B/12.5	B/13.2	B/13.2	B/13.2
	DEXTER ST NB	E/77.3	F/95.7	F/97.1	F/95.7
	OVERALL INTERSECTION	D/40.8	D/49.5	D/50.6	D/49.5
7.	**DEXTER ST & GOFF AVE**				
	GOFF AVE EB	D/40.8	D/39.0	D/37.5	C/33.4
	GOFF AVE WB	B/14.6	B/15.2	C/20.2	C/25.6
	DEXTER ST SB	D/52.8	D/53.5	D/53.5	D/54.4
	DEXTER ST NB	D/36.7	D/36.0	D/36.0	D/35.6
	OVERALL INTERSECTION	C/33.9	C/33.3	C/34.0	D/35.8
8.	**MAIN ST & PINE ST**				
	MAIN ST WB	B/17.9	B/17.8	B/17.8	B/17.5
	PINE ST NB	A/5.5	A/5.6	A/5.8	A/5.8
	PINE ST SB	A/6.0	A/6.2	A/8.1	A/8.1
	OVERALL INTERSECTION	A/7.4	A/7.5	A/8.3	A/8.3
9.	**CHURCH ST & PINE ST**				
	CHURCH ST EB	B/12.0	B/12.1	B/12.2	B/12.2
	PINE ST NB	A/7.1	A/7.2	A/7.2	A/7.2
	OVERALL INTERSECTION	A/9.6	A/9.7	A/9.9	A/9.9
10.	**MINERAL SPRING AVE & MAIN ST**				
	MINERAL SPRING AVE EB	B/15.8	B/16.2	B/16.2	B/16.2
	MAIN ST NB	A/6.8	A/7.1	A/7.2	A/7.1
	MAIN ST SB	A/8.3	A/8.8	A/9.1	B/10.1
	OVERALL INTERSECTION	A/10.0	B/10.6	B/10.5	B/11.1

Projected Traffic Conditions

Existing traffic volumes were first projected to represent 2010. Projected ridership information was then used to estimate the trip generation for each of the proposed station sites. The distribution of the station-related traffic was estimated, and the traffic was assigned to the surrounding street network. The future build scenarios were analyzed in terms of capacity analyses. The methodologies employed and the results obtained are presented below.

2010 Background Traffic

Existing traffic volumes in the study area were projected to represent 2010 by a two-step process. First, existing traffic volumes were increased by an annual growth rate of 0.5% per year, which is a typical growth rate for an urbanized area. The growth rate was recommended by the Rhode Island Statewide Planning Program (RISPP) and was based upon growth analyses that have been conducted in relation to the statewide traffic model.

Secondly, known developments in the area were identified. The Pawtucket Department of Planning and Redevelopment noted the conversion of two mills on Goff Avenue which will result in approximately 300 residential units. Trip generation and distribution were estimated for these residential units and the trips were superimposed on the traffic flow map for 2010. The resultant 2010 traffic conditions are referred to as 2010 "background" traffic and are shown in Figures 4 and 5 for the AM peak hour and the PM peak hour, respectively.

Commuter Station Site-Generated Traffic

The trip generation of the two proposed station sites was estimated based upon the projected ridership for each site. A high and a low estimate of ridership in the peak period were generated for each site. For the purposes of the traffic analysis, the following assumptions were made:

- The peak period consists of two hours. The peak hour comprises 60% of the peak period ridership,
- Vehicle occupancy rate is 1.1 persons/vehicle,
- The high estimate was used in the traffic analysis to provide a conservative analysis,
- Of the trips generated, 84% are assumed to be park and ride users. The remaining 16% of the transit riders are referred to as

"kiss and ride" users since they are dropped off and picked up at the station.

In the peak hours, the two sites are expected to generate the following traffic volumes:

	Enter	Exit
AM Peak Hour		
Central Falls/Pawtucket Station Site	567	91
P&W Yard Site	655	105
PM Peak Hour		
Central Falls/Pawtucket Station Site	91	567
P&W Yard Site	105	655

Trip Distribution

The trip distribution for the trips generated by each of the station alternatives was estimated based upon the projected ridership information. Ridership was estimated using the Rhode Island Traffic Analysis Zones (TAZ) of the statewide model. The likely travel route for each of the TAZs with potential ridership was identified. The amount of traffic on the routes to and from each station was accumulated. The trip distribution is shown graphically in Figure 6 for the Pawtucket/Central Falls Station Site and in Figure 7 for the P&W Yard Site.

2010 Build Traffic Volumes

The trips expected to be generated by the Pawtucket/Central Falls Station Site have been distributed to the surrounding street network for the AM and PM peak hour conditions. The site traffic was then superimposed upon the 2010 background traffic. The resultant traffic volumes are shown in Figures 8 and 9.

Likewise, the trips expected to be generated by the P&W Yard Site were distributed to the surrounding street system. The site generated traffic was superimposed on the 2010 background traffic. Figure 10 shows the 2010 AM

peak hour traffic volumes with the P&W Yard Site and Figure 11 shows the 2010 PM peak hour traffic volumes.

Capacity Analysis for Projected Conditions

The projected 2010 traffic conditions at key intersections were analyzed in terms of capacity analyses. The 2010 scenarios evaluated include:

- Background Traffic Conditions
- Build Pawtucket/Central Falls Station Site
- Build P&W Yard Site

The scenarios were each evaluated for the AM and PM peak hour conditions. The results of the capacity analyses are summarized in Tables 5-8.

As the results indicate, the intersection levels of service at most of the locations analyzed do not change significantly. Typically, LOS "D" and better is acceptable in an urbanized area. At a number of the intersections analyzed, the overall LOS reduces by one grade with the commuter station traffic added. However, the resultant intersection LOS remains LOS "D" or better.

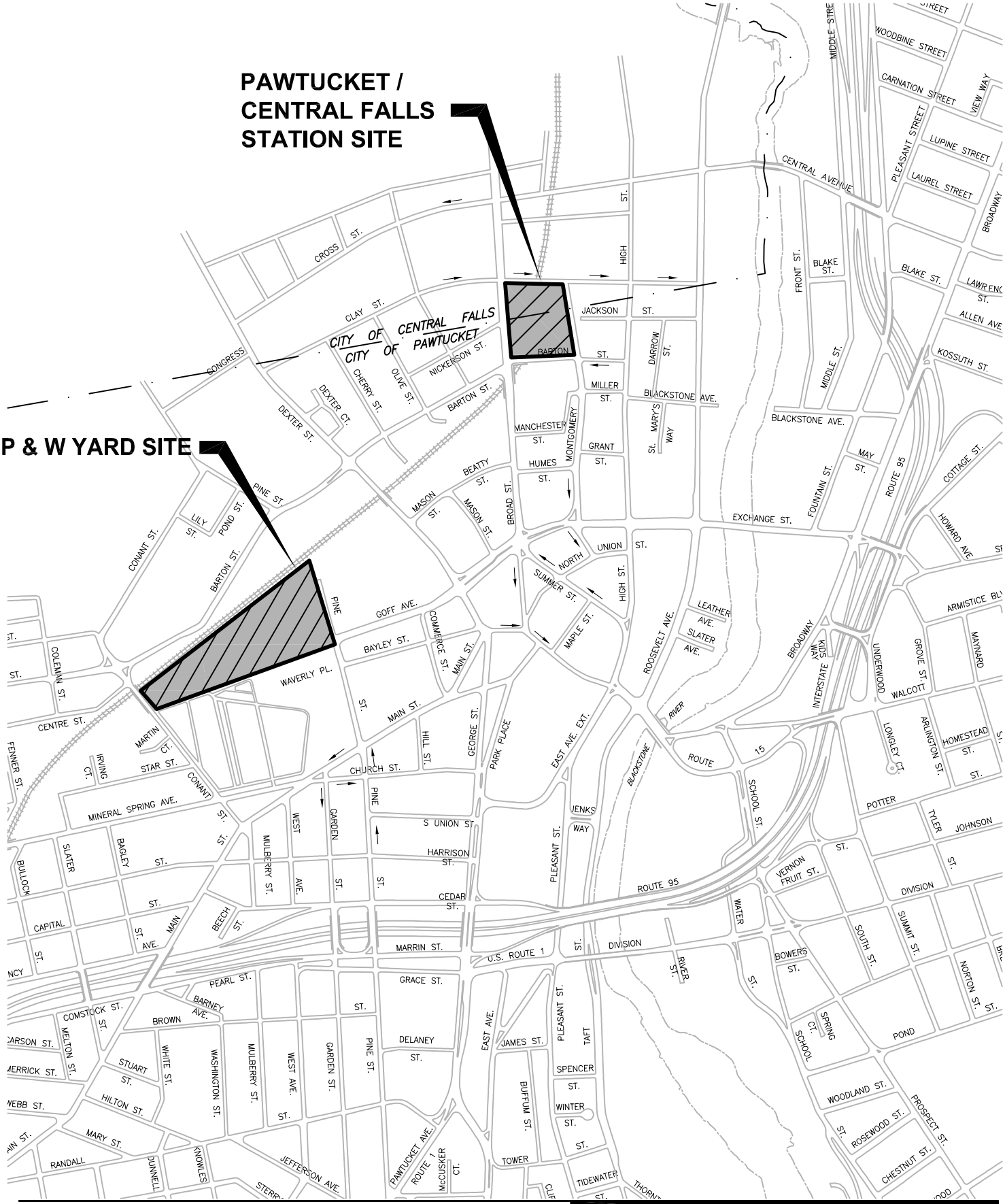
There are two intersections that resulted in a LOS reduction to "E" or "F"with the commuter station traffic, and the results were the same for each of the proposed station sites. At the unsignalized intersection of Broad Street and Clay Street, the Clay Street eastbound approach reduces from LOS "E" to "F" in the peak hours with the station traffic. The overall LOS at the signalized intersection of Broad Street/Goff Avenue/Exchange Street reduces from LOS "D" to LOS "E" in the peak hours with the station traffic.

At the signalized intersection of Broad Street/Cross Street, the overall LOS reduces two grades from LOS "B" to LOS "D" in the PM peak hour with the projected traffic from the Pawtucket/Central Falls Station Site. This is due largely to the increase traffic flow for the northbound left turn.

Based on the overall results of the capacity analysis, the projected station traffic will influence traffic operations at key intersections surrounding the sites. With the exception of the two intersections described above, the resultant LOS at nearby intersections is acceptable. The traffic impacts associated with each of the two station sites are very similar. When compared, neither of the two proposed station sites results in superior traffic operations.

The results of the capacity analyses are useful for identifying potential off-site improvement locations. Improvements should be considered at the

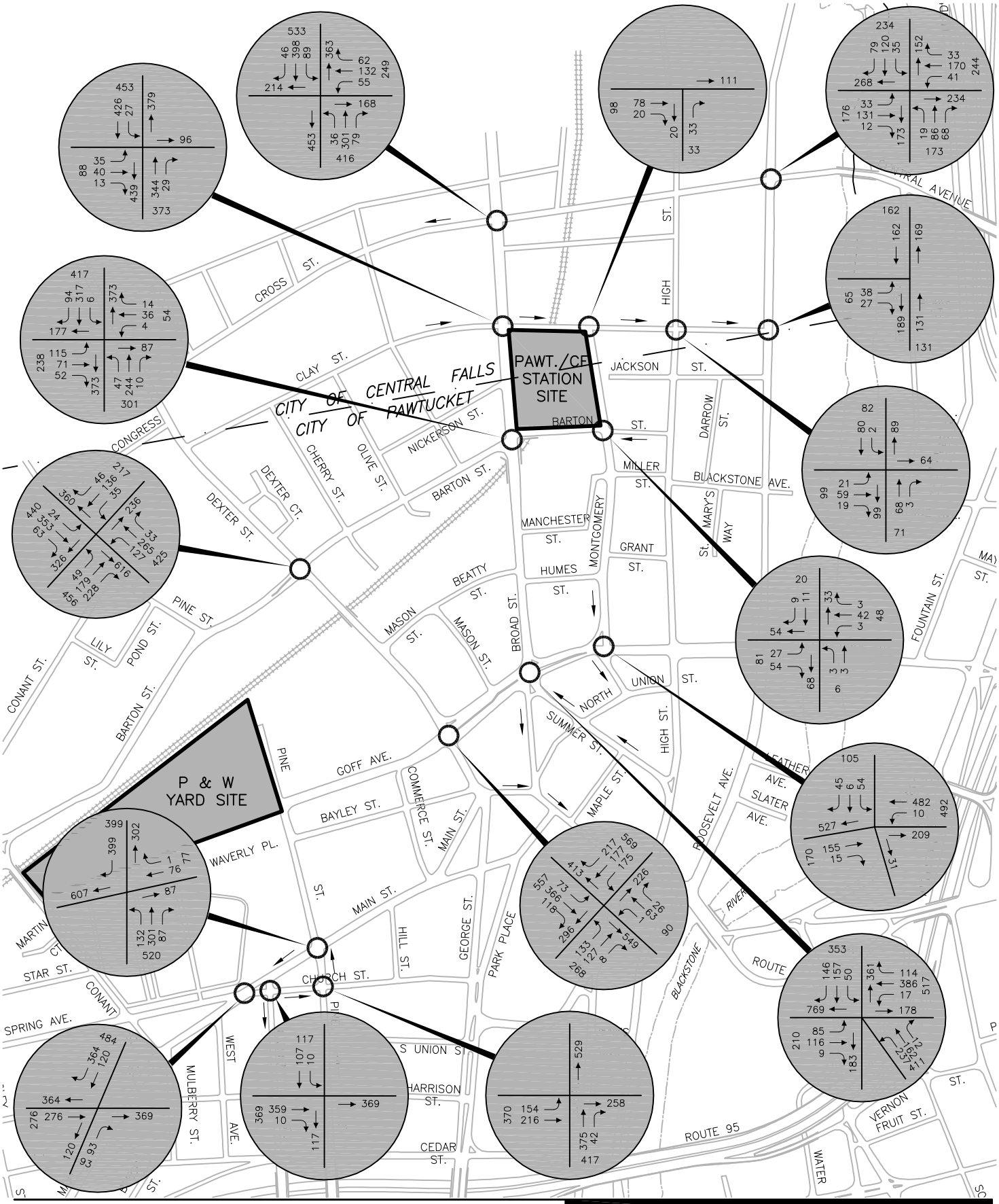
intersections of Broad Street/Clay Street and Broad Street/Goff Avenue/Exchange Street for both of the station sites. If the Pawtucket/Central Falls site is identified as the preferred site, then off-site improvements may also be considered at Broad Street/Cross Street.



Pawtucket/Central Falls Commuter Rail Facility
Feasibility Study and Site Analysis

Figure 1

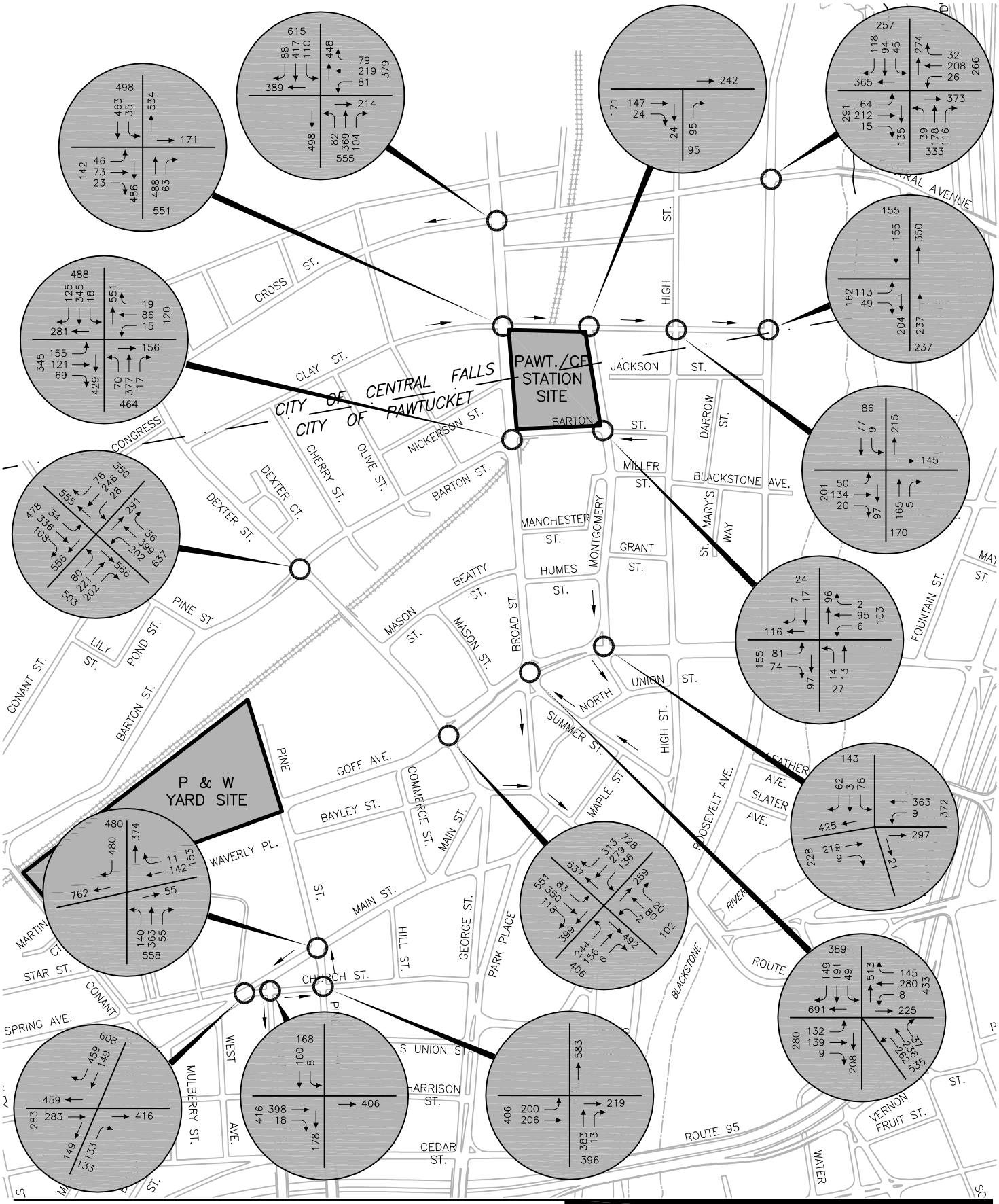
Project Area



Pawtucket/Central Falls Commuter Rail Facility
Feasibility Study and Site Analysis

Figure 2

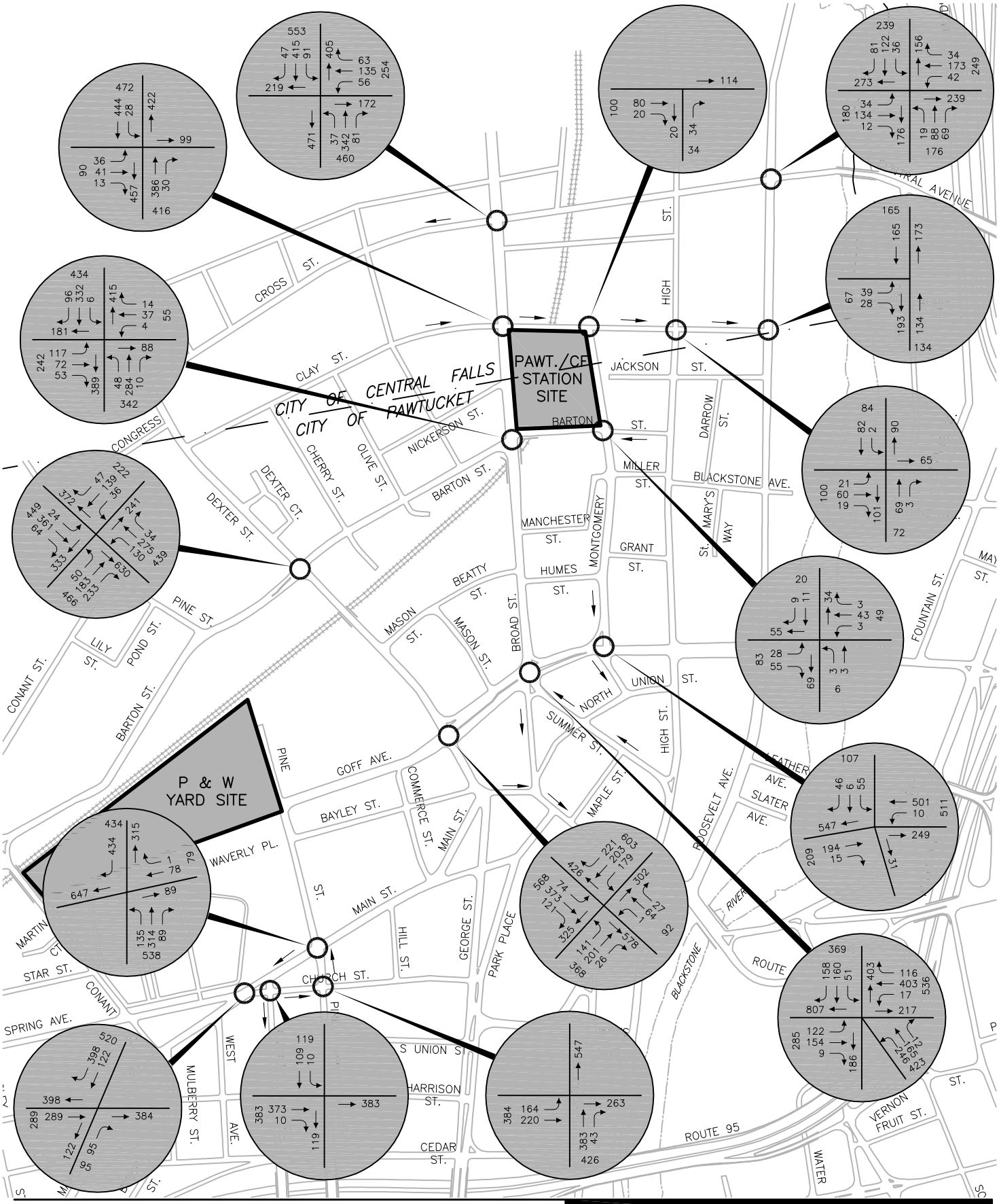
2006 AM Peak Hour Traffic
Existing Conditions



Pawtucket/Central Falls Commuter Rail Facility
Feasibility Study and Site Analysis

Figure 3

2006 PM Peak Hour Traffic
Existing Conditions

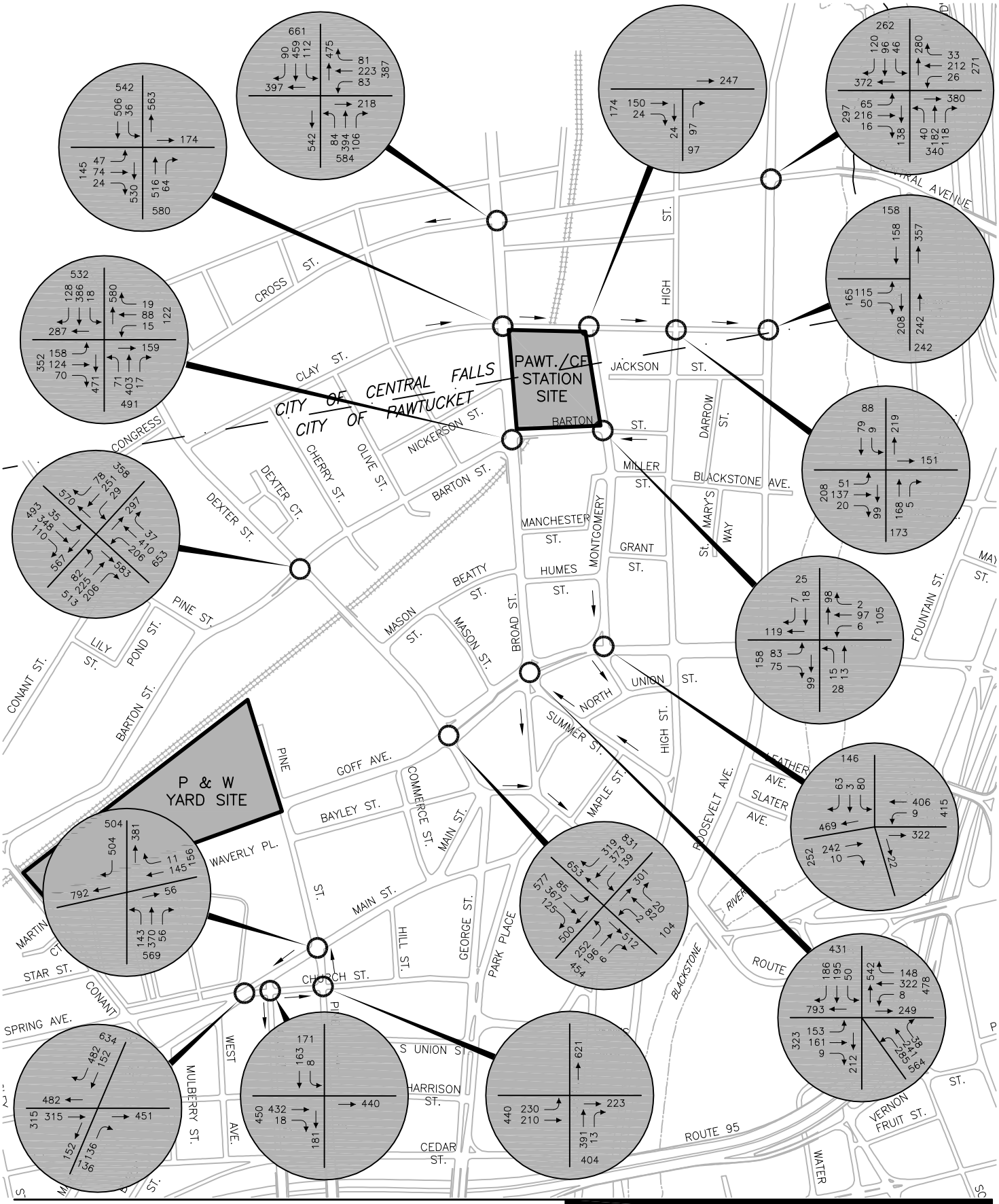


0 300 600 Feet

Pawtucket/Central Falls Commuter Rail Facility
Feasibility Study and Site Analysis

Figure 4

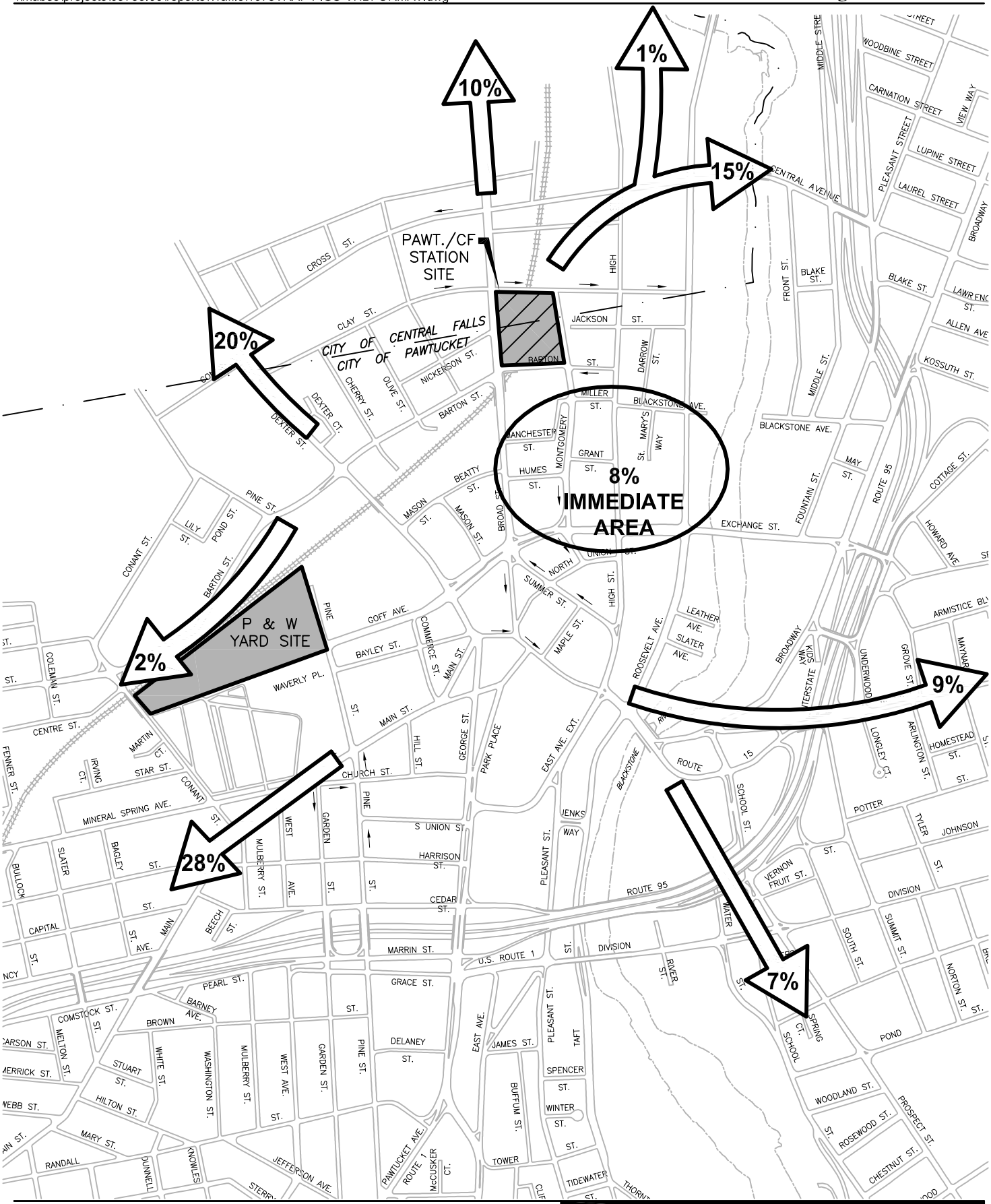
2010 AM Peak Hour Background Traffic



Pawtucket/Central Falls Commuter Rail Facility
Feasibility Study and Site Analysis

Figure 5

2010 PM Peak Hour Background Traffic

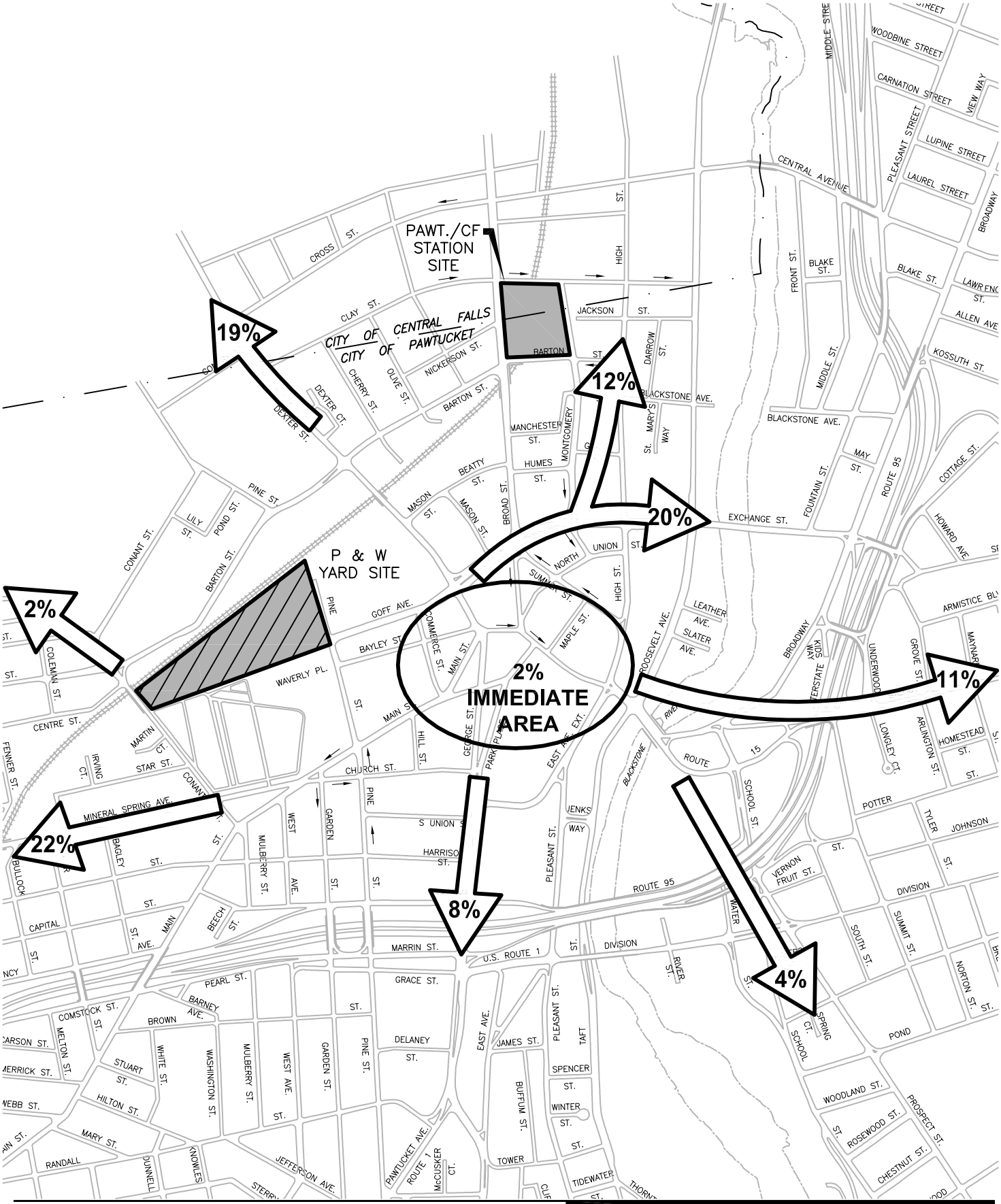


0 400 800 Feet

Pawtucket/Central Falls Commuter Rail Facility
Feasibility Study and Site Analysis

Figure 6

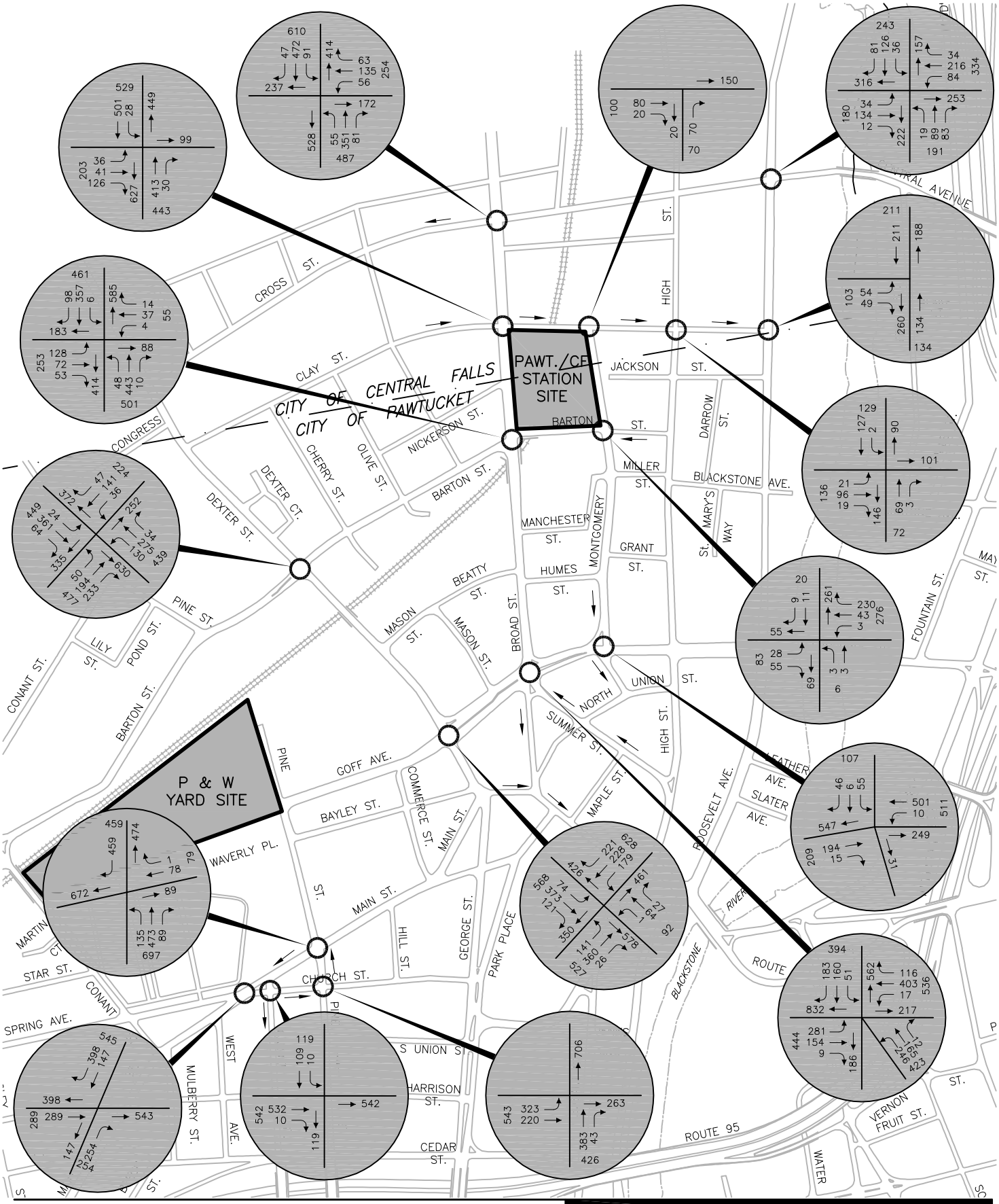
Trip Distribution for
Pawtucket / Central Falls Station Site



Pawtucket/Central Falls Commuter Rail Facility
Feasibility Study and Site Analysis

Figure 7

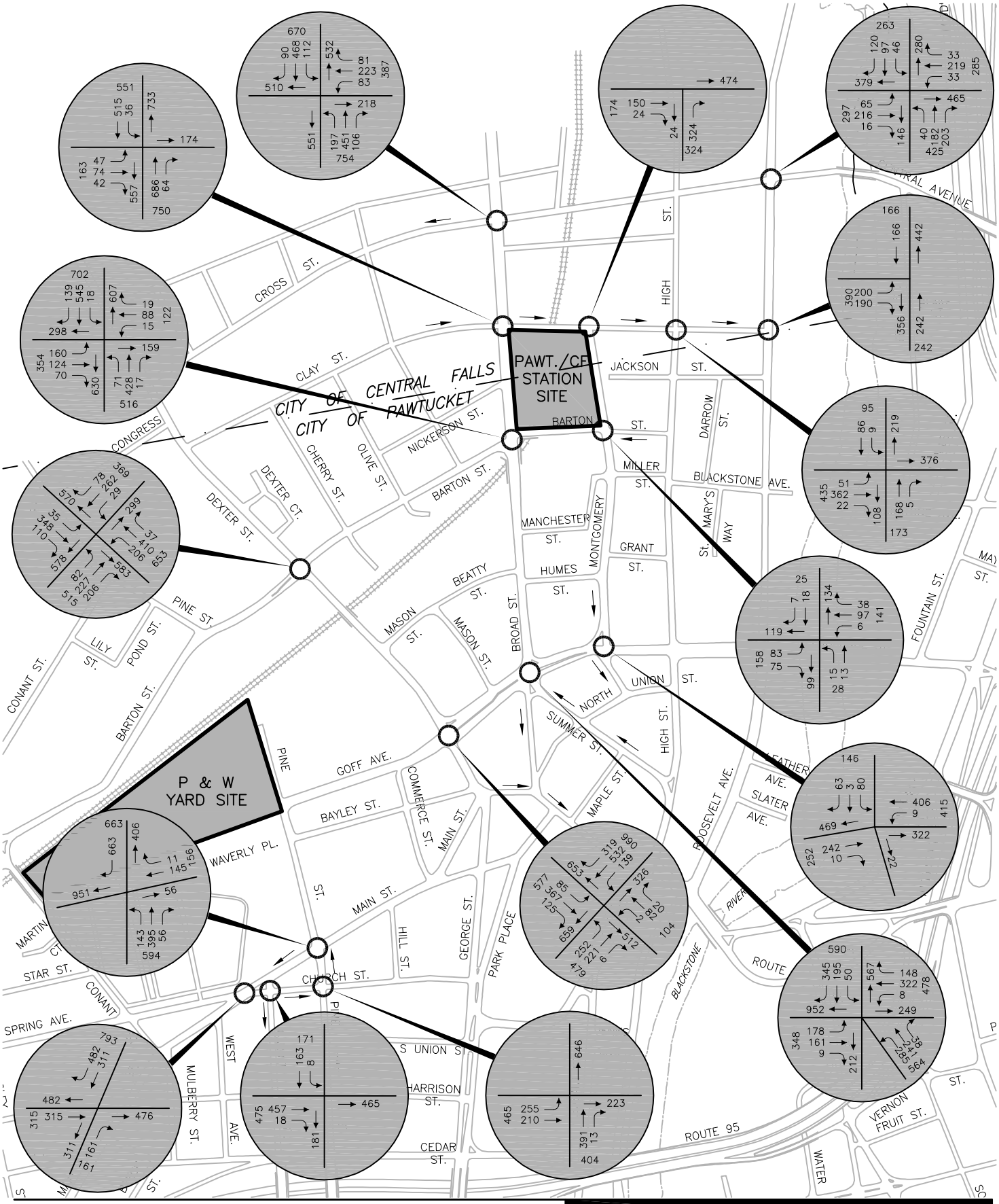
Trip Distribution for
P & W Yard Site



Pawtucket/Central Falls Commuter Rail Facility
Feasibility Study and Site Analysis

Figure 8

2010 AM Peak Hour Traffic
Pawtucket / Central Falls Station Site

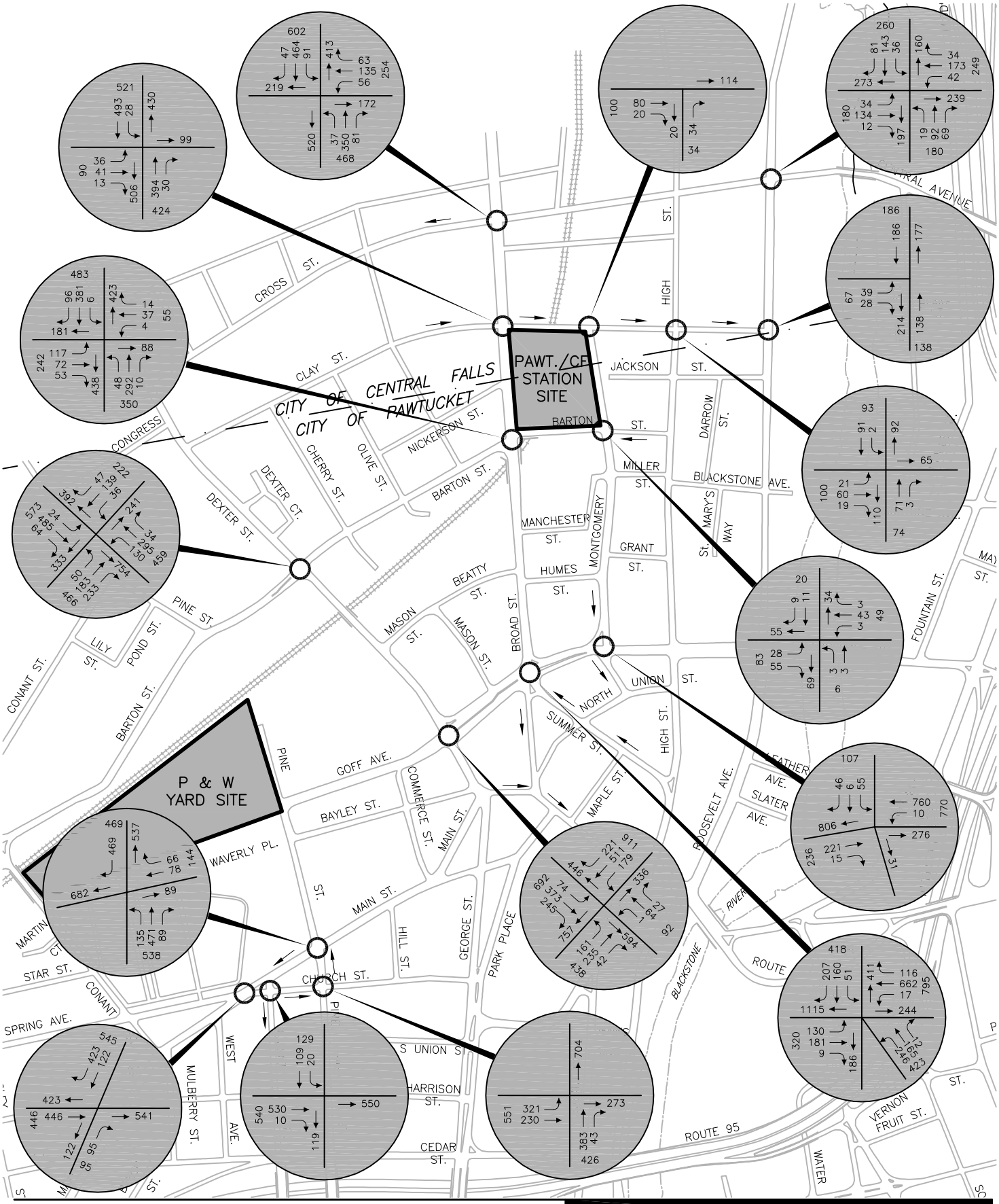


Pawtucket/Central Falls Commuter Rail Facility
Feasibility Study and Site Analysis

Figure 9

2010 PM Peak Hour Traffic
Pawtucket / Central Falls Station Site

0 300 600 Feet

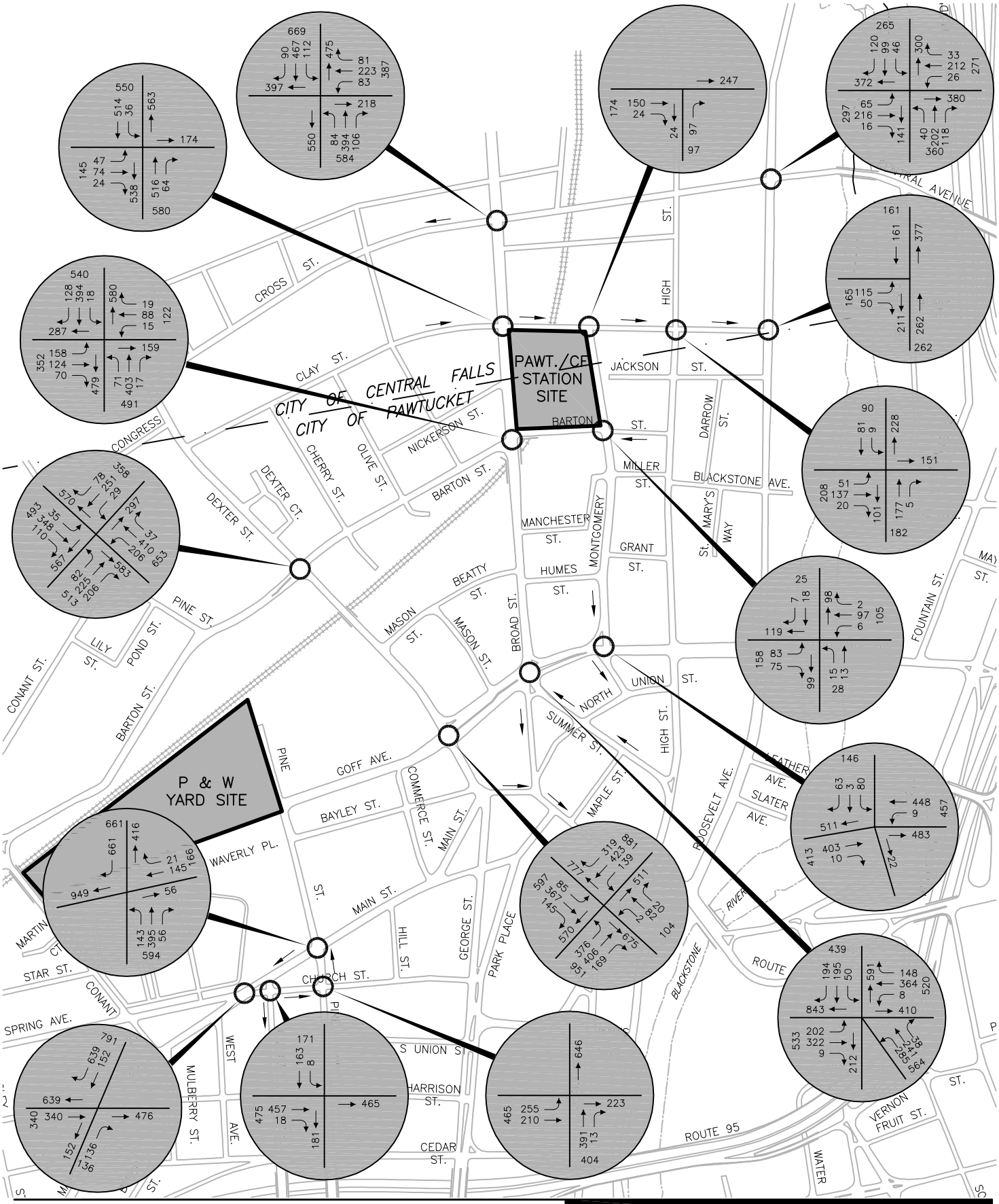


Pawtucket/Central Falls Commuter Rail Facility
Feasibility Study and Site Analysis

Figure 10

2010 AM Peak Hour Traffic
P & W Yard Site

0 300 600 Feet



Pawtucket/Central Falls Commuter Rail Facility
Feasibility Study and Site Analysis

Figure 11

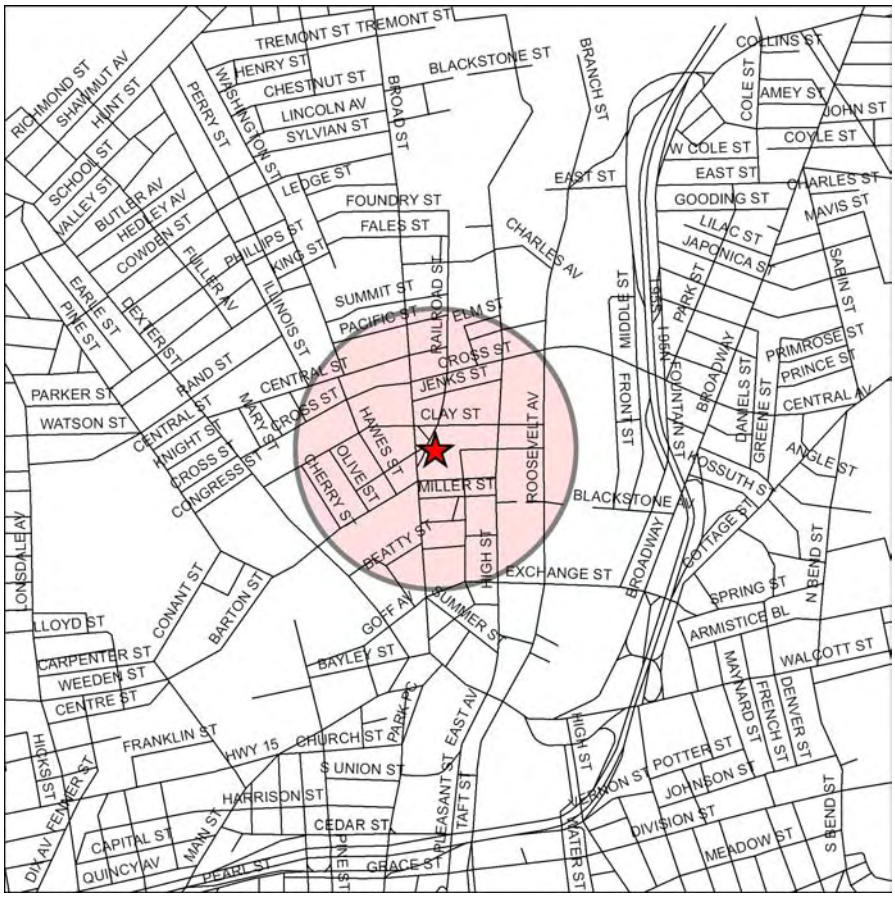
2010 PM Peak Hour Traffic
P & W Yard Site

Traffic and Parking Analysis

The information presented previously in the chapter on "Traffic Evaluation" has been used to identify parking and traffic impacts related to the rail station itself and the transit-oriented development. Available parking within a quarter-mile radius of the proposed rail site has been inventoried. Off-site traffic improvements have been developed.

Parking Survey

A parking survey was conducted for the proposed site of the Pawtucket/Central Falls Commuter Rail Facility. The parking survey was conducted on May 30, 2007 between 9 AM and 4 PM. The parking survey was conducted in a one-quarter mile radius of the train station. The survey area is shaded below.



The inventory did not reveal off-street public parking areas. The off-street parking in this area consisted of private property serving the adjacent residential and commercial sites. There were no off-street parking areas available for general public parking.

There are a total of 561 on-street parking spaces within one-quarter of a mile of the proposed rail station. The on-street parking serves both the residential and the commercial land uses. The on-street parking spaces were identified on a block-by-block basis. The inventory revealed several locations with "time restricted" on-street parking. A summary of the on-street parking is provided in Table 1 below.

Pawtucket/ Central Falls Commuter Rail
Summary of Parking Inventory

Street	Total Number of Spots	Number of Spots with Parking Restrictions	Posted Parking Restrictions
Pacific Street	28		
Central Street	33	2	Handicap Parking Only
Cross Street	18		
Jenks Street	12		
Clay Street	66	19	1 Hour Parking
		2	Nurses Parking Only
Nickerson Street	18		
Jackson Street	18		
Barton Street	27	6	3 Hour Parking
Miller Street	5		
Blackstone Avenue	0		
Manchester Street	0		
Grant Street	8		
Mason Beatty Street	0		
Humes Street	13	5	1 Hour Parking
Cherry Street	15		
Mason Street	0		
Olive Street	18		
Hawes Street	29		
Broad Street	67	13	1 Hour Parking
		23	2 Hour Parking
Railroad Street	22		
Montgomery Street	62	10	3 Hour Parking
		9	2 Hour Parking
		9	1 Hour Parking
		4	15 Minute Parking
Elms Street	5		
High Street	51	4 3	2 Hour Parking
		3	1 Hour Parking
		1	Handicap Only Parking
Darrow Street	11		
St. Mary's Way	0		
Roosevelt Avenue	35	7	15 Minute Parking
		3	90 Minute Parking
TOTAL:	561	116	

GRA notes that in the non-residential areas, there are signs posted which read "NO PARKING TOW ZONE, MONDAYS 8 AM TO 3 PM, APRIL-NOVEMBER, STREET SWEEPING." These signs are generally ignored by the public.

Traffic Analysis

The traffic analysis conducted for this project has included the inventory and evaluation of existing traffic conditions, the projection and evaluation of 2010 background traffic volumes, trip generation, distribution, and assignment for the proposed commuter rail sites, and an evaluation of the traffic operations associated with the two rail sites under consideration. These analyses are described in detail in the chapter on "Traffic Evaluation."

Since the initial traffic evaluation, the Pawtucket/Central Falls Station Site has been identified as the preferred alternative. The traffic analysis described herein involves conceptual improvements aimed at mitigating the traffic impacts of the preferred alternative rail site.

Potential Locations for Improvements

In selecting the locations for potential improvement, the results of the accident and capacity analyses were considered. Key intersections in the study area with accident rates greater than 1.5 accidents per million entering vehicles (MEV) were identified. Of these locations, the intersections that will be affected by the proposed rail station were identified as potential improvement locations. These include:

- Broad Street/Cross Street
- Broad Street/Clay Street
- Broad Street/Barton Street
- Barton Street/Dexter Street

Capacity analyses were conducted for key intersections in the study area for a number of scenarios including the projected 2010 traffic volumes with the proposed commuter rail station at the preferred site. Based upon the capacity analysis results for that scenario, key intersections with poor Levels of Service projected were identified as potential locations for improvements and included:

- Broad Street/Clay Street
- Broad Street/Goff Avenue/Exchange Street

Key intersections in the project area at which Level of Service declined by more than one level were also identified as potential locations for improvements. One intersection was identified and included:

- Broad Street/Cross Street

Proposed Conceptual Traffic Improvements

A wide range of traffic improvements were considered for the locations cited in the previous section. For example, traffic signal installations, conversion to one-way streets, signal coordination, the provision of additional capacity, and pedestrian improvements were considered. The overall benefit of each improvement was assessed and the various improvements were compared.

The improvements that achieved the greatest traffic benefit were recommended.

The proposed train station is expected to draw traffic from various directions. The trip distribution was discussed in detail in the Chapter on Traffic Evaluations. Within that chapter, a graphic entitled "Trip Distribution for Pawtucket/Central Falls Station Site" shows the dispersion of traffic as relates to the station site. The distribution occurs fairly evenly in a radial manner and as such, the impact of the additional traffic is also fairly evenly dispersed. There is not any one area of the City street system that bears the burden of impact. As a result, traffic operations in the project area are generally at adequate Levels of Service for an urbanized area even with the additional traffic expected to be generated by the rail station.

There are two intersections with poor levels of service and improvements are recommended at each of these intersections.

The intersection of **Broad Street/Goff Avenue/Exchange Street** is expected to operate at LOS "E" during the peak hours with the rail station traffic. This intersection carries large volumes of traffic. With the exception of the Broad Street southbound approach, each approach has at least two approach lanes. If the Broad Street southbound approach were to be widened to accommodate two approach lanes at this intersection, the overall intersection LOS would improve to LOS "C." This improvement is recommended. Note that right-of-way may be required to implement this traffic improvement.

The intersection of **Broad Street/Clay Street** is currently unsignalized and by 2010, the side street approach is expected to reach capacity. With the rail station traffic, the Clay Street approach will reduce to LOS "F." Signalization was considered at this intersection. The Federal highway Administration (FHWA) publishes warrants for the installation of traffic signals in the Manual on Uniform Traffic Control Devices (MUTCD). The warrants are based upon a variety of factors including traffic volumes, lane arrangements, speed, pedestrian activity, systems, and accident history. Due to the limited data available for this location, all of the warrants could not be evaluated. The intersection does meet the Peak Hour Warrant based upon the 2010 peak traffic volumes with the rail station. Based on this and the potential of this intersection to operate as part of a coordinated signal system, traffic signal installation is recommended for Broad Street/Clay Street.

Furthermore, Clay Street intersects Broad Street between two signalized intersections; Broad Street at Barton Street and Broad Street at Cross Street. The three intersections were evaluated for signal coordination. Coordinatability analysis reports were run for these intersections.

Coordinatability factors range from 0 to 100 and the higher the factor, the more beneficial the coordination. Coordination is generally recommended for locations with coordinatability factors greater than 50. The factors are based on a number of elements including travel time, storage space, main street volume, cycle length increases, and the proportion of traffic in the platoon. The coordinatability factors for these intersections were between 65 and 81 in the AM peak hour and between 70 and 100 in the PM peak hour. Based upon these results, **signal coordination on Broad Street at Barton Street, Clay Street and Cross Street** is recommended.

Pedestrian access is good throughout most of the study area. The major roadways have adequate sidewalks and most of the traffic signals have pedestrian signal heads and phasing. **At the intersection of Broad Street/Clay Street, crosswalks should be painted and the proposed traffic signal should include pedestrian signal heads and pedestrian phasing**.

The locations of the recommended conceptual traffic improvements are presented on Figure 1. The improvements were evaluated in terms of capacity analyses. The results were compared to the previously projected Levels of Service (LOS) and are shown in the following table.

TABLE 1
SUMMARY OF SIGNALIZED INTERSECTIONS CAPACITY ANALYSIS RESULTS

2010 with Pawtucket/Central Falls Station SIte LEVEL OF SERVICE/AVGERAGE CONTROL DELAY (Sec./Veh.)				
	AM PEAK		PM PEAK	
SIGNALIZED INTERSECTIONS	without improvements	with improvements	without improvements	with improvements
BROAD ST & CROSS ST				
CROSS ST WB	C/21.7	E/78.1	C/28.7	E/77.5
BROAD ST NB	D/45.3	D/47.1	E/64.9	D/36.2
BROAD ST SB	B/12.2	A/9.9	B/11.6	B/12.6
OVERALL INTERSECTION	C/26.4	D/37.9	D/37.0	D/36.2
BROAD ST & CLAY ST				
CLAY ST EB	unsignalized	C/25.6	unsignalized	C/31.2
BROAD ST SB	intersection	A/3.6	intersection	A/8.1
BROAD ST NB		A/5.8		A/5.5
OVERALL INTERSECTION		A/9.3		B/10.0
BROAD ST & BARTON ST				
BARTON ST EB	B/17.5	B/18.1	C/20.2	C/33.2
BARTON ST WB	B/13.1	B/13.7	B/13.4	B/18.0
BROAD ST NB	B/10.3	B/17.9	B/11.4	B/15.7
BROAD ST SB	B/13.3	B/11.9	C/24.8	B14.5
OVERALL INTERSECTION	B/12.9	B/15.7	B/18.6	B/19.0
BROAD ST & GOFF AVE/ EXCHANGE ST				
GOFF AVE EB	C/33.5	C/27.3	B/13.5	B/11.8
EXCHANGE ST WB	D/54.8	C/20.8	D/35.9	C/31.9
BROAD ST NB	E/71.6	C/33.8	F/102.7	D/39.9
BROAD ST SB	E/76.6	D/50.9	F/114.3	D/50.2
OVERALL INTERSECTION	E/58.0	C/32.5	E/76.7	D/36.3

As the results indicate, the recommended improvements result in adequate levels of service at these intersections based upon 2010 traffic volumes with the commuter rail traffic. Note that the signal coordination on Broad Street at Barton Street, Clay Street, and Cross Street results in a slight decrease in overall Level of Service at Cross Street. The timings of the coordinated signal system are set to optimize the main street traffic flow. Sometimes the traffic operations of the minor street are sacrificed for the good of the arterial flow when a system is coordinated. The LOS on Broad Street through the coordinated signal system is as follows:

Arterial Level of Service – Broad Street

	Northbound	Southbound
AM Peak Hour	LOS "D"	LOS "C"
PM Peak Hour	LOS "D"	LOS "C"

Additional improvement concepts were considered. For example, the conversion of two-way roadways to one-way traffic was considered to consolidate conflict points and to possibly allow more on-street parking. However, the benefits of such conversions were outweighed by the impacts to the surrounding community.

While most of the recommended improvements were identified based upon the results of capacity analyses, improvements were also considered for intersections with a high occurrence of accidents. As discussed previously, four intersections were identified as potential improvement locations based upon the accident rates. Recommendations have been proposed at three of these intersections including Broad Street/Barton Street, Broad Street/Clay Street, and Broad Street/Cross Street. These three intersections are in close proximity to the proposed rail station and will be affected by the traffic generated by the commuter rail station.

The fourth intersection with a high accident rate is Barton Street/Dexter Street. Although this intersection is not in the immediate proximity of the proposed commuter rail station, it will carry some additional traffic generated by the rail station. The additional traffic does not reduce the intersection Level of Service as shown previously in the "Traffic Evaluation" chapter. Based upon the existing conditions and accident history, **further study of Barton Street/Dexter Street is recommended.** Collision diagrams should be prepared to determine whether there are discernable patterns of

accidents at this location. The need for the additional studies at this intersection is not a result of the proposed commuter rail station.

In summary, the traffic recommendations are:

- Signalize Broad Street/Clay Street. Install crosswalks and provide pedestrian phasing.
- Coordinate the traffic signals on Broad Street at Barton Street, Clay Street, and Cross Street.
- Increase the capacity of the Broad Street southbound approach at Goff Avenue and Exchange Street.
- Conduct a safety analysis at the Barton Street/Dexter Street intersection.

E

Appendix E: Financial Backup

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OPTION 1 - PAWTUCKET/CENTRAL FALLS COST ESTIMATE - REUSE EXISTING STATION

PROJECT NO.: 10160343

Prepared By: J. Cash Date: 11/6/2006
Checked By: D. Peterson Date: 11/6/2006

Item No./ Specification Section	DESCRIPTION	QTY	UNIT	UNIT COST	SUB-TOTAL COST	TOTAL COST
1	Renovate Existing Station Structure	34,380	SF	$ 175	$ 6,016,500	**$ 6,016,500**
	Includes:					
	External renovation of building envelope					
	Interior renovation of building finishes					
	Renovation of building utilities					
2	Structural Strengthening of Building	1	Lump Sum	$ 1,800,000	$ 1,800,000	**$ 1,800,000**
	Includes:					
	Repair of Building Support Girders Over Tracks					
	Repair of Building Floor Slabs					
3	New Parking Garage	735	Spaces	$ 23,000	$ 16,905,000	**$ 16,905,000**
	(7 Levels / 735 Cars)					
4	New Train Platforms	1,600	FT	$ 1,200	$ 1,920,000	**$ 1,920,000**
	2@ 800 Ft. ea w/ Canopies)					
5	Relocate Catenary Supports	26	EA	$ 43,100	$ 1,120,600	**$ 1,120,600**
6	Track Signals and Communication	1	Lump Sum	$ 125,000	$ 125,000	**$ 125,000**
	Includes:					
	High Speed Train Passenger Warning System					
7	Civil	1	Lump Sum	$ 1,312,850	$ 1,312,850	**$ 1,312,850**
	Includes:					
	Street Work					
	Sidewalks					
	Utilities					
	Landscaping					
	Parking Lot Surface					
8	Retaining Walls	1	Lump Sum	$ 1,011,000	$ 1,011,000	**$ 1,011,000**
	Along East Side of Track #2					
	Along Portion Of West Side of ROW					
	Backfill For Comercial Sites					
9	Modification of East Wing of Existing Station to Allow Platform	1	Lump Sum	$ 520,200	$ 520,200	**$ 520,200**
	Shoring of Existing Building					
	Demolition of Existing Wall/Foundation					
	Rebuild Station Wall					
10	Replace Existing Clay Street Bridge	1	Lump Sum	$ 2,654,000	$ 2,654,000	**$ 2,654,000**
11	Replace Existing Jenks Street Bridge	1	Lump Sum	$ 2,654,000	$ 2,654,000	**$ 2,654,000**
12	Replace Existing Cross Street Bridge	1	Lump Sum	$ 2,654,000	$ 2,654,000	**$ 2,654,000**
13	RR Insurance Premiums	1	Lump Sum	$ 50,000	$ 50,000	**$ 50,000**
14	AMTRAK Delay/Permit Costs	1	Lump Sum	$ 5,000	$ 5,000	**$ 5,000**
15	Hazmat Removal	1	Lump Sum	$ -	$ -	**$ -**
16	Off Site/Entrance Traffic Improvement	1	Lump Sum	$ -	$ -	**$ -**

	Sub-Total Cost	**$ 38,748,150**
Add:	**30% Contingency**	**$ 11,624,445**
	20% Design	**$ 7,749,630**
	TOTAL COST:	**$ 58,123,000**

Assumptions:

1. Land acquisition costs not included
2. Parking garage has 3 levels and 315 parking spaces
3. Does not include commercial development costs

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URS

OPTION 2A - PAWTUCKET/CENTRAL FALLS COST ESTIMATE - NEW STATION

PROJECT NO.: 10160343

Prepared By: J. Cash Date: 11/6/2006
Checked By: D. Peterson Date: 11/6/2006

Item No./ Specification Section	DESCRIPTION	QTY	UNIT	UNIT COST	SUB-TOTAL COST	TOTAL COST
1	New Station Structure	34,380	SF	$ 250	$ 8,595,000	**$ 8,595,000**
2	Demolition of Existing Station	1	Lump Sum	$ 1,100,000	$ 1,100,000	**$ 1,100,000**
3	New Parking Garage	735	Spaces	$ 23,000	$ 16,905,000	**$ 16,905,000**
	(7 levels / 735 Cars)					
4	New Train Platforms	1,600	FT	$ 1,200	$ 1,920,000	**$ 1,920,000**
	2@ 800 Ft. ea					
5	Relocate Catenary Supports	26	EA	$ 43,100	$ 1,120,600	**$ 1,120,600**
6	Track Signals and Communication	1	Lump Sum	$ 125,000	$ 125,000	**$ 125,000**
	Includes:					
	High Speed Train Passenger Warning System					
7	Civil	1	Lump Sum	$ 1,312,850	$ 1,312,850	**$ 1,312,850**
	Includes:					
	Street Work					
	Sidewalks					
	Utilities					
	Landscaping					
8	Retaining Walls	1	Lump Sum	$ 1,011,000	$ 1,011,000	**$ 1,011,000**
	Along East Side of Track #2					
	Along Portion Of West Side of ROW					
	Backfill For Comercial Sites					
9	Replace Existing Clay Street Bridge	1	Lump Sum	$ 2,654,000	$ 2,654,000	**$ 2,654,000**
10	Replace Existing Jenks Street Bridge	1	Lump Sum	$ 2,654,000	$ 2,654,000	**$ 2,654,000**
11	Replace Existing Cross Street Bridge	1	Lump Sum	$ 2,654,000	$ 2,654,000	**$ 2,654,000**
12	RR Insurance Premiums	1	Lump Sum	$ 50,000	$ 50,000	**$ 50,000**
13	AMTRAK Delay/Permit Costs	1	Lump Sum	$ 5,000	$ 5,000	**$ 5,000**
14	Hazmat Removal	1	Lump Sum	$ -	$ -	**$ -**
15	Off Site/Entrance Traffic Improvement	1	Lump Sum	$ -	$ -	**$ -**

	Sub-Total Cost	**$ 40,106,450**
Add:	**30% Contingency**	**$ 12,031,935**
	20% Design	**$ 8,021,290**
	TOTAL COST:	**$ 60,160,000**

Assumptions:

1. Land acquisition costs not included
2. Parking garage has 3 levels and 315 parking spaces
3. Does not include commercial development costs
4. New station has same SF floor area.

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URS

OPTION 3 - PAWTUCKET/CENTRAL FALLS COST ESTIMATE - P&W SITE

PROJECT NO.: 10160343

Prepared By: J. Cash Date: 11/6/2006
Checked By: D. Peterson Date: 11/6/2006

Item No./ Specification Section	DESCRIPTION	QTY	UNIT	UNIT COST	SUB-TOTAL COST	TOTAL COST
1	New Train Platforms	1,600	FT	$ 1,200	$ 1,920,000	**$ 1,920,000**
	2@ 800 Ft. ea W/ Canopies					
2	Cross Track Pedestrain Access	1	Lump Sum	$ 1,500,000	$ 1,500,000	**$ 1,500,000**
3	Relocate Catenary Supports	26	EA	$ 43,100	$ 1,120,600	**$ 1,120,600**
4	Track Signals and Communication	1	Lump Sum	$ 875,000	$ 875,000	**$ 875,000**
	Includes:					
	High Speed Train Passenger Warning System					
	Relocate Signal					
5	Civil	1	Lump Sum	$ 1,931,500	$ 1,931,500	**$ 1,931,500**
	Includes:					
	Street Work					
	Sidewalks					
	Utilities					
	Landscaping					
5a	New Parking Garage	500	Spaces	$ 17,000	$ 8,500,000	**$ 8,500,000**
	(4 levels / 500 cars)					
6	RR Insurance Premiums	1	Lump Sum	$ 50,000	$ 50,000	**$ 50,000**
7	AMTRAK Delay/Permit Costs	1	Lump Sum	$ 5,000	$ 5,000	**$ 5,000**
8	Relocating P&W Rail Yard	1	Lump Sum	$ -	$ -	**$ -**
9	Hazmat Removal	1	Lump Sum	$ -	$ -	**$ -**
10	Off Site/Entrance Traffic Improvement	1	Lump Sum	$ -	$ -	**$ -**

	Sub-Total Cost	**$**	**15,902,100**
Add:	**30% Contingency**	**$**	**4,770,630**
	20% Design	**$**	**3,180,420**
	TOTAL COST:	**$**	**23,854,000**

Assumptions:

1. Land acquisition costs not included

2. Conant Street Bridge will be modified to allow pedestrians to cross over the tracks between the parking lot and the platforms

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URS

Job PAWTUCKET / CENTRAL FALLS Project No. 10160343 Page ___ of ___
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DETERMINE APPROX. EST OF EXIST. STATION AREA

AREA (WAITING RM LEVEL) $\cong (160)^2 - (92 \times 44) = 21,552$ SF

AREA (UPPER LEVEL) $\cong$ 21,552
- 2560 (16'x160')
- 6164 (67'x92')
12,828 SF

TOTAL PLAN AREA $\cong$ 21,552 + 12,828 = 34,380 SF

DETERMINE APPROX. EST. OF PARKING GARAGE AREA

NOTE:
- SCOPE CALLS FOR 300 - 500 CARS.
- ASSUME MIN (3) PARKING LEVELS

GARAGE W/ EXIST. STATION (OPTION 1 & 2A)

AREA (SF) = (115 x 334) 3 = 115,230 SF

GARAGE W/O USING EXIST. STATION (OPTION 2B)

AREA (SF) = [(190x115) + (138x115) + ½(60)(115)] 3

AREA (SF) = (21850 + 15870 + 3450) 3

AREA (SF) = 123,510 SF

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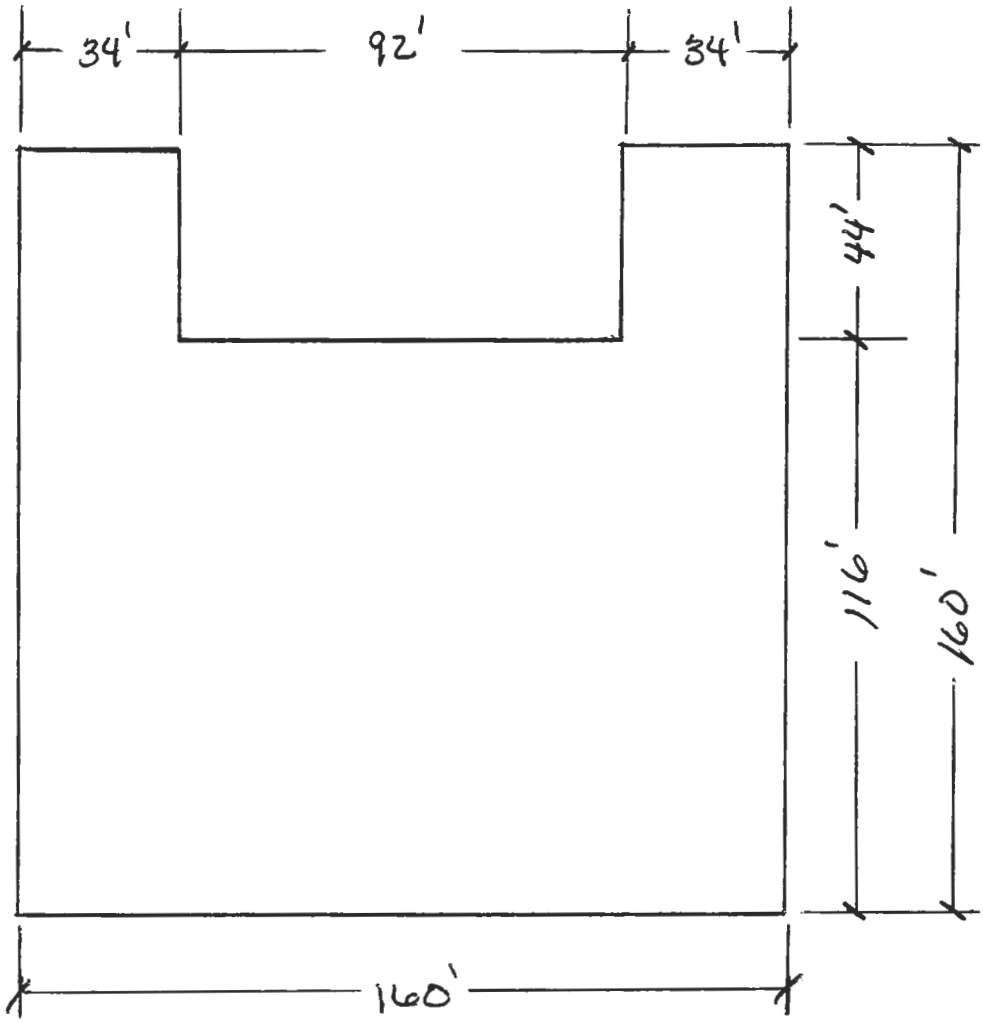
DETERMINE SQ FT OF EXISTING STATION



URS

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Reference

PARKING GARAGE (CONT)

CHECK DHK UNIT COST ($85/SF) WITH ORANGE & W. HAVEN.

$$\text{UNIT COST}_{WH} = \frac{\$8095400}{\sim 201,552\ SF} = \$40.17/SF$$

$$\text{UNIT COST}_{O} = \frac{\$11,037,260}{\sim 236,634} = \$46.64/SF$$

COMPARE COST/SPACE

$$\text{COST/SPACE}_{WH} = \frac{\$8095400}{470} = \$17,224/\text{SPACE}$$

$$\text{COST/SPACE}_{O} = \frac{\$11,037,260}{470} = \$23,484/\text{SPACE}$$

$$\text{COST/SPACE}_{DHK} = \frac{\$9,792,000}{315} = \$31,086/\text{SPACE}$$

DEMOLITION OF EXISTING STATION

(REF: MEANS - BLDG DEMOLITION - MIXED CONST - PG 35)

VOL OF BLDG = (21,552 SF)(~36') = 775,872 CF

USE: 800,000 CF

UNIT COST (NO FDN) = $0.27/CF \times 1.25 = \$0.34/CF$
(INFL.)

DEMOLITION (CONT.)

DAILY OUTPUT ≅ 20,000 CF

BECAUSE WORK IS OVER ACTIVE TRACKS, INCREASE COST BY 50% DUE TO TIME/SCHD. ISSUES.

UNIT COST = 1.5 (0.34) = $0.51/CF

COST (SUPERSTRUCTURE) ≅ $0.51 (800,000) = $408,000

SLAB-ON-GRADE

FOR 8" SLAB, UNIT COST ≅ $6.10/SF × (8"/6") × 1.25 = $10.16/SF

AREA ≅ (34' × 160') 2 = 10,880 SF (BLDG WINGS)

COST (SLAB) = 10,880 (10.16) ≅ $110,540

FOUNDATION

FTG. (2' × 3')

2[160' + 2(34')] (20.50 × 1.25 × 1.10) ≅ 12,850 (INFL. 1.25, REINF 1.10)

FTG WALL (ASSUME 12" × 4')

UNIT COST ≅ $18.40 × 1.25 = $23.00/SF

(456')(4')(23.00) ≅ $41,950

AMTRAK COSTS

ASSUME 60 DAYS @ $4000/DAY = $240,000

DEMOLITION (CONT)

REMOVAL OF HAZARDOUS MATERIAL

FROM A SIMILAR DEMOLITION PROJECT, POST OFFICE, WORCESTER, MA, USE

LUMP SUM COST : $ 250,000

TOTAL COST

SUPERSTRUCTURE	$ 408,000
SLAB-ON-GRADE	110,540
FOOTING	12,850
FOOTING WALL	41,950
HAZARD MATERIAL	250,000
	$ 823,340
AMTRAK COSTS	240,000
	$ 1,063,340

SAY : $ 1,100,000 ←

URS

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Reference

CATENARIES

RELOCATE EXISTING CATENARIES ON PLATFORMS FROM CANTILEVERED TO OVERHEAD SPAN.

ASSUME: APPROX. 26 LOCATIONS

$30,000/LOCATION NEW SUPPORT

$2,000/LOCATION DEMO EXIST

$32,000/LOCATION

FOR AMTRAK COSTS, ASSUME (3) MOS @ 24 DAYS/MO

AMTRAK COSTS = 3(24)($4000/DAY) = $288,000

TOTAL COST = 26(32,000) + 288,000 = $1,120,000 ←

RAISED PLATFORMS

EARTHWORK/EXCAVATION: $20.00/FT
PRECAST CONCRETE: $80.00/FT
$1000./FT

FROM NEWBURYPORT JOB

FROM ORANGE, CT JOB, FOR RAISED PLATFORM W/ 62% CANOPIES, PRECAST CONCRETE,

UNIT COST = $2,409,264/2160 FT ≈ $1,115/FT

∴ USING $1200/FT,

COST = 2 × 800' × $1200 = $1,920,000

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RAISED PLATFORMS (CONT)

FOR P&W SITE, LONG RAMPS ARE REQ'D TO GAIN ACCESS FROM BRIDGE TO PLATFORMS.

USE A UNIT COST OF APPROX 1.67 x1200

UNIT COST ≈ $2000/FT

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Reference

DETERMINE APPROXIMATE COST FOR REPAIR OF BUILDING SUPPORT GIRDERS

METAL CLEANING

SAND BLAST - HEAVY PITTING = 1.25 ($3.20/SF) = $4.00/SF
(MEANS 2005 PG 205; 1.25 = INFLATION)

AREA/GIRDER ≅ 1/12 [(2 × 30") + (3 × 20")] (90') = 900 SF/GIRDER
(2 × 30" = WEB; 3 × 20" = FLG)

TOTAL (INC. COLS) = 8 (900) × 1.5 = 10,800 SF
(1.5 = COLS)

COST = (4.00) (10,800) = $43,200.

TIME TO COMPLETE ≅ 10800/800 = 13.5 DAYS
(800 = DAILY OUTPUT)

REPAIR

ASSUME E-2 STEEL CREW ≅ $5000./DAY

ASSUME ~15-DAYS / GIRDER (90') = $75,000/GIRDER

STEEL PL

WEB: (3/4"/12) (90') (30"/12) 490 PCF = 6891#
FLG: ~(1"/12) (90') (20"/12) 490 PCF = 6125
13,016#

FOR GALV. STEEL, ASSUME $1.50/lb

STEEL COSTS = (8) (13,016) (1.25) (1.50) = $195,240
(1.25 = MISC)

GIRDER REPAIR (CONT)

TOTAL COST = $600,000 + $195,240 = $795,240
(MAT.)

FINISH

ASSUME STEEL WILL BE PAINTED

ASSUME $2.00/SF (2-COATS)

TOTAL AREA (INCL COLS / LAT BRACING) ≅ 10,800 SF

COST = (2.00/SF)(10,800) = $21,600

AMTRAK COSTS (FLAGMEN, ETC)

ASSUME ($4000/DAY)(~15 + 120 + 10) = $580,000
(CLEANING; 120 = REPAIR; 10 = PAINT)

TEMPORARY SHORING

FROM MEANS, PG 149, USE AN APPROXIMATE UNIT COST OF ≈ $20/SF

SHORING COST ≅ $20/SF (92' × 116') = $213,440

URS

Job PAWTUCKET/CENTRAL FALLS Project No. 10160343 Page ___ of ___
Description COST EST. Computed by JC Sheet 10 of 11
Checked by DEP Date 9/28/06
Date 9/29/06
Reference

FIREPROOFING

REMOVE EXISTING FIREPROOFING OVER TRACKS, MAKE REPAIRS, APPLY NEW FIREPROOFING,

ASSUME APPROX. COST ≈ ($3 + $1/SF) (92x116) ≅ $42,700
APPLY ↑ ↑ REMOVAL

SLAB REPAIR

ACTUAL NO. & LOCATION OF REPAIR AREAS UNKNOWN,

ASSUME:

CONC. DEMOLITION: ~ $15/SF FOR 8" SLAB
CONC. REPAIR: ~ $20/SF
$35/SF

ASSUME ≈ 15% OF SLAB REQ'S REPAIR

COST ≅ 0.15 (10,672 SF) ($35/SF) = $56,028

SAY: $60,000

TOTAL COSTS - REPAIR

CLEANING:	$43,200
STEEL REPAIR:	795,240
PAINT:	21,600
TEMP. SHORING:	213,440
FIREPROOFING:	42,700
SLAB REPAIR:	60,000
AMTRAK COSTS:	580,000
	$1,756,180

SAY: $1,800,000

URS

Job PAWTUCKET / CENTRAL FALLS Project No. 10160243 Page ___ of ___
Description FEASIBILITY STUDY - COST ESTIMATE Computed by DEP Sheet 11 of 11
Checked by T. B. Date 9/27/06 Date 9/27/06
Reference

SIGNALS & COMMUNICATION

OPTIONS 1, 2A & 2B - EXISTING STATION SITE

- HIGH SPEED TRAIN PASSENGER WARNING SYSTEM L.S. $125,000

OPTION 3 - P&W RAIL YARD SITE

- HIGH SPEED TRAIN PASSENGER WARNING SYSTEM $125,000
- RELOCATE SIGNAL $750,000

L.S. TOTAL = $875,000

REFERENCES

"Neil Levitt"
<nlevitt@dhkinc.com>
09/18/2006 04:47 PM

To <Jack_Cash@URSCorp.com>
cc "Mickey Krockmalnic" <mkrockmalnic@dhkinc.com>
bcc
Subject Cost Figures as Requested

Jack,

Mickey gave me some figures for you to use:

Please offer him the following:

Cost of rehab of exiting building ($/sf) - $175/sf

Cost of parking garage ($/sf) - $85/sf.

Cost for new station building ($/sf) - $250/sf

Hope this is helpful.

Neil

"Mickey Krockmalnic "
<mkrockmalnic @dhkinc.com
>
09/20/2006 08:17 PM

To <Jack_cash@urscorp.com>
cc "Neil Levitt" <nlevitt@dhkinc.com>
bcc
Subject RE: P/CF Estimate

Jack, I would offer the following as lump sum landscaping costs:

Option 1 - $45,000

Option 2 - $40,000

Option 3 - $75,000

-----Original Message-----
From: Neil Levitt
Sent: Wednesday, September 20, 2006 7:03 PM
To: 'Jack_cash@urscorp.com'
Cc: Mickey Krockmalnic
Subject: RE: P/CF Estimate

Jack,

I will look into this ASAP. However, both Mickey and I will be out of the office tomorrow. Are you looking for a lump sum for each of the sites as a whole or for SF costs for "landscaping" or for unit costs for materials? If either of us can respond from the road, we will do so if you want to provide answers to the above or to write out any of the other questions you want to review. Otherwise, I will be available midmorning on Friday to talk over any/everything that you wish.

Hope that there were no great puzzles that you couldn't solve in the drawings sent. Talk with you on Friday.

Neil

-----Original Message-----
From: Jack_cash@urscorp.com [mailto:Jack_cash@urscorp.com]
Sent: Wednesday, September 20, 2006 4:22 PM
To: Neil Levitt
Subject: Re: P/CF Estimate

Neil,

Do you have a cost for proposed landscaping at the sites (3-options, lump sum?).

I will call you tomorrow to clarify some info.

Thanks,

Jack

URS

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Description COST EST. Computed by JC Sheet ____ of ____

Checked by ____ Date 9/22/06

Date ____

Reference

NOTES FROM TELCON W/ BILL LEMKE, CHIEF EST., NY OFFICE (212-609-6071) 9/20/06

NEW CONST - OVER TRACKS

AIRPORT $1000/SF
SCHOOL $240/SF

FOR BLDG & TRACK WORK
(BLDG, PLATFORM, CATENARY)

USE ~ $800/SF FOR ~ 35,000 SF STATION

→ ~ $28 MIL

COSTS WILL BE HIGH FOR AMTRAK
(FLAGGING, CATENARY, ETC)

IN NY, THEY HAVE COST OF ~ $4000/CY
FOR CAST-IN-PLACE PLATFORMS

LOTS OF EXCLUSIONS

NOTES FROM TELCON W/ LOU FREE, ARCH, ROCKY HILL

SUBS OUT MOST ESTIMATING

RECOMMENDS CALL TO BILL LEMKE, NY

NOTES FROM CONVERSATION W/ RICK CARPENITO

NEWBURYPORT STATION JOB (1997)

(INCLS STATION, PARK, LANDS., ETC) → $482/SF FOR SMALL STATION ($1.547 MIL)

CALL HUNT VALLEY (TRANSPORTATION ...)

Option 1 - Reuse Existing Terminal Building				
Item	Quantity	Unit	Unit Price	Total Price
Earthwork				
Excavation of Pavement	4,400	CY	$ 30	$ 132,000
Loam & Seed	1,770	SY	$ 15	$ 26,550
Roadway				
Hot Mix Asphalt	830	Tons	$ 100	$ 83,000
Base Course	830	Tons	$ 100	$ 83,000
Gravel Borrow	2,165	CY	$ 30	$ 64,950
Cement Concrete for Sidewalk	4,110	SY	$ 60	$ 246,600
Wheel Chair Ramps	23	EA	$ 1,000	$ 23,000
Granite Curb - Curved	1,185	LF	$ 40	$ 47,400
Granite Curb - Straight	2,160	LF	$ 30	$ 64,800
Signing & Striping	1	LS	$ 5,000	$ 5,000
Drainage				
Manholes	10	EA	$ 3,500	$ 35,000
Catch Basin	13	EA	$ 3,000	$ 39,000
12" RCP	645	LF	$ 45	$ 29,025
15" RCP	340	LF	$ 50	$ 17,000
Site				
Lighting	1	LS	$ 150,000	$ 150,000
Trees	41	EA	$ 750	$ 30,750
Shrubs	43	EA	$ 250	$ 10,750
Hardscape (benches trash, receptacles, etc.)	1	LS	$ 75,000	$ 75,000
Irrigation Allowance	1	LS	$ 25,000	$ 25,000
Utility Services and Relocations	1	LS	$ 50,000	$ 50,000
Other				
Mobilization	1	LS	$ 50,000	$ 50,000
Traffic Management	1	LS	$ 25,000	$ 25,000
Subtotal				***$ 1,312,825***
Infrastructure Contingency	30%			$ 393,848
Design/Permitting/Construction Phase Services	20%			$ 262,565
GRAND TOTAL			**SAY**	**$ 1,970,000**

Notes:

1. All costs are in 2006 dollars.
2. Estimate does not include ROW acquisition costs.

Option 2 - Integrate Existing Terminal with New Parking Structure				
Item	Quantity	Unit	Unit Price	Total Price
Earthwork				
Excavation	4,400	CY	$ 30	$ 132,000
Loam & Seed	680	SY	$ 15	$ 10,200
Roadway				
Hot Mix Asphalt	830	Tons	$ 100	$ 83,000
Base Course	830	Tons	$ 100	$ 83,000
Gravel Borrow	2,100	CY	$ 30	$ 63,000
Cement Concrete for Sidewalk	3,890	SY	$ 60	$ 233,400
Wheel Chair Ramps	23	EA	$ 1,000	$ 23,000
Granite Curb - Curved	1,185	LF	$ 40	$ 47,400
Granite Curb - Straight	2,160	LF	$ 30	$ 64,800
Signing & Striping	1	LS	$ 5,000	$ 5,000
Drainage				
Manholes	10	EA	$ 3,500	$ 35,000
Catch Basin	13	EA	$ 3,000	$ 39,000
12" RCP	645	LF	$ 45	$ 29,025
15" RCP	340	LF	$ 50	$ 17,000
Site				
Lighting	1	LS	$ 150,000	$ 150,000
Trees	5	EA	$ 750	$ 3,750
Shrubs	11	EA	$ 250	$ 2,750
Hardscape (benches trash, receptacles, etc.)	1	LS	$ 75,000	$ 75,000
Irrigation Allowance	1	LS	$ 10,000	$ 10,000
Utility Services and Relocations	1	LS	$ 50,000	$ 50,000
Other				
Mobilization	1	LS	$ 50,000	$ 50,000
Traffic Management	1	LS	$ 25,000	$ 25,000
Subtotal				$ 1,231,325
Infrastructure Contingency	30%			$ 369,398
Design/Permitting/Construction Phase Services	20%			$ 246,265
GRAND TOTAL			**SAY**	**$ 1,850,000**

Notes:

1. All costs are in 2006 dollars.
2. Estimate does not include ROW acquisition costs.

Pawtucket / Central Falls
Station Site Options
Civil Capital Costs

Option 3 - Providence & Worcester Rail Yard Site				
Item	**Quantity**	**Unit**	**Unit Price**	**Total Price**
Earthwork				
Excavation	13,000	CY	$ 30	$ 390,000
Loam & Seed	12,500	SY	$ 15	$ 187,500
Roadway				
Hot Mix Asphalt	350	Tons	$ 100	$ 35,000
Base Course	350	Tons	$ 100	$ 35,000
Gravel Borrow	5,200	CY	$ 30	$ 156,000
Cement Concrete for Sidewalk	4,600	SY	$ 60	$ 276,000
Wheel Chair Ramps	22	EA	$ 1,000	$ 22,000
Granite Curb - Curved	2,000	LF	$ 40	$ 80,000
Granite Curb - Straight	5,000	LF	$ 30	$ 150,000
Signing & Striping	1	LS	$ 5,000	$ 5,000
Drainage				
Manholes	7	EA	$ 3,500	$ 24,500
Catch Basin	10	EA	$ 3,000	$ 30,000
12" RCP	900	LF	$ 45	$ 40,500
15" RCP	600	LF	$ 50	$ 30,000
Site				
Lighting	1	LS	$ 150,000	$ 150,000
Trees	60	EA	$ 750	$ 45,000
Shrubs	100	EA	$ 250	$ 25,000
Hardscape (benches trash, receptacles, etc.)	1	LS	$ 75,000	$ 75,000
Irrigation Allowance	1	LS	$ 50,000	$ 50,000
Utility Services and Relocations	1	LS	$ 50,000	$ 50,000
Other				
Mobilization	1	LS	$ 50,000	$ 50,000
Traffic Management	1	LS	$ 25,000	$ 25,000
Subtotal				***$ 1,931,500***
Infrastructure Contingency	30%			$ 579,450
Design/Permitting/Construction Phase Services	20%			$ 386,300
GRAND TOTAL			**SAY**	**$ 2,900,000**

Notes:

1. All costs are in 2006 dollars.
2. Estimate does not include ROW acquisition costs.

SUMMARY OF ESTIMATE

A. RAILROAD ELEMENTS COST SUMMARY			
		Order of Magnitude Cost	
Item	unit	W Haven	Orange
Trackwork & Roadway		$ 3,167,000	$ 1,853,600
Signal & Communications		$ 12,100,000	$ 12,100,000
Electrification		$ 687,500	$ 360,800
Relocation of Transmission Lines		$ 247,500	$ 22,000
sub-total		$ 16,202,000	$ 14,336,400
Design Contingency, Incidentals, Construction Contingency	32%	$ 5,184,600	$ 4,587,600
Total		$ 21,386,600	$ 18,924,000

B. ARCHITECTURAL ELEMENTS COST SUMMARY			
		Order of Magnitude Cost	
Item	unit	W Haven	Orange
Station Building		$ 969,200	$ 759,000
Parking Garage		$ 8,095,400	$ 11,037,300
Platforms		$ 2,959,900	$ 2,409,300
Site Furnishings alw		$ 976,000	$ 1,052,200
Cross-Track Pedestrian Access		$ 1,403,200	$ 2,371,600
sub-total		$ 14,403,700	$ 17,629,400
Design Contingency, Incidentals, Construction Contingency	32%	$ 4,609,200	$ 5,641,400
Total		$ 19,012,900	$ 23,270,800

C. SITE ELEMENTS COST SUMMARY			
		Order of Magnitude Cost	
Item	unit	W Haven	Orange
Site Grading & Preparation		$ 644,600	$ 2,607,100
Parking & Roads		$ 1,463,500	$ 1,650,900
Site Utilities		$ 311,200	$ 1,008,900
Drainage		$ 256,900	$ 659,600
sub-total		$ 2,676,200	$ 5,926,500
Design Contingency, Incidentals, Construction Contingency	32%	$ 856,300	$ 1,896,500
Total		$ 3,532,500	$ 7,823,000

D. OFF-SITE IMPROVEMENTS			
		Order of Magnitude Cost	
Item	unit	W Haven	Orange
Off-Site Improvements		$ 364,800	$ 143,200
sub-total		$ 364,800	$ 143,200
Design Contingency, Incidentals, Construction Contingency	32%	$ 116,700	$ 45,800
Total		$ 481,500	$ 189,000

E. GENERAL CONDITIONS			
		Order of Magnitude Cost	
Item	unit	W Haven	Orange
General Conditions		$ 2,280,300	$ 2,276,400
sub-total		$ 2,280,300	$ 2,276,400
Design Contingency, Incidentals, Construction Contingency	32%	$ 729,700	$ 728,400
Total		$ 3,010,000	$ 3,004,800

(A to E) CONSTRUCTION TOTAL, COST SUMMARY			
		Order of Magnitude Cost	
Item	unit	W Haven	Orange
Railroad		$ 21,386,600	$ 18,924,000
Architectural		$ 19,012,900	$ 23,270,800
Site		$ 3,532,500	$ 7,823,000
Off-Site Improvements		$ 481,500	$ 189,000
General Conditions for 24 months		$ 3,010,000	$ 3,004,800
sub-total		$ 47,423,500	$ 53,211,600
Rounded Total		$ 47,000,000	$ 53,000,000

PROPERTY ACQUISITION			
		Order of Magnitude Cost	
Item	unit	W Haven	Orange
Site Acquisition		$ 9,500,000	$ 7,500,000
sub-total		$ 9,500,000	$ 7,500,000

Orange Alternative
Cost Estimate Summary

Item	Quantity	Unit	Unit Price	Total	Rounded Total	Add-Ons	Notes
A. RAIL ELEMENTS							
A.1 TRACKWORK							
track ballast protection during platform construction, 1080lf x 46'w	49,680	sf	$0.11	$5,465			
drainage ditch clear and maintain (2 side)	5,600	lf	$5.50	$30,800			
mobilize hirail equipment and provide temp access and wetlands protections	1	alw	$55,000.00	$55,000			
Track Protection & Maintenance				**$91,265**			
demol track #1, replaced by crossovers	500	tkft	$68.20	$34,100			
demol. track #5 between crossovers	2,800	tkft	$95.70	$267,960			
Track Demolition				**$302,060**			
new #5 continuous welded rail 140RE CWR, ballast, concrete ties	2,300	tkft	$331.10	$761,530			
tamp and align track #1 adjacent to new crossovers, supplement ballast- per VHB 11-10-04	400	tkft	$96.80	$38,720			
Track- New & Rework				**$800,250**			
No. 20 Crossover- (pg.30), Track 1/5, frog & switch including assumed 250 lf area ea. of tie and track premiums	2	alw	$330,000.00	$660,000			
Track Crossover 250 tkft ea				**$660,000**			
SUB-TOTALTRACKWORK				**$1,853,575**	**$1,853,600**		
A.2 ELECTRIFICATION							
motorized catenary disconnect switch at crossovers	2	ea	$27,500.00	$55,000			
catenary crossover, assume 300 lf ea	600	lf	$110.00	$66,000			
new catenary at track five	2,200	lf	$99.00	$217,800			
energize 2 switches	2	alw	$11,000.00	$22,000			
SUB-TOTAL ELECTRIFICATION				**$360,800**	**$360,800**		
A.3 RELOCATION OF TRANSMISSION LINES							
relocate guy wires at platform area, for catenary poles 982 & 983	2	alw	$11,000.00	$22,000			
SUB-TOTAL TRACK UTILITY RELOCATION				**$22,000**	**$22,000**		
A.4 SIGNAL AND COMMUNICATIONS							
Signal and Communications per control point	2	alw	$6,050,000.00	$12,100,000			
SUB-TOTAL SIGNAL & COMMUNICATIONS				**$12,100,000**	**$12,100,000**		
RAIL ELEMENT TOTAL				**$14,336,375**	**$14,336,400**	**$4,587,600**	
B. ARCHITECTURAL ELEMENTS							
B.1 STATION AND VENDOR AREA							
station area within garage	3,000	sf	$253.00	$759,000			includes vendor space
vendor area within garage, unfinished	0	sf	$132.00	$0			6,520 SF optional additional vendor space
SUB-TOTAL STATION AND VENDING AREA				**$759,000**	**$759,000**		
B.2 PARKING GARAGE (470 SPACES)							
clear and grub	2.9	ac	$5,500.00	$14,405			
Excavation, Earth	1,356	cy	$11.00	$14,911			
Backfill, Gravel	904	cy	$30.80	$27,834			
Concrete; Grade Beams & Frost Wall	452	cy	$209.00	$94,437			
Fmwk; Grade Beams & Frost Wall	17,080	sfca	$5.50	$93,940			
Reinf; Grade Beams & Frost Wall	36	tn	$2,310.00	$83,502			
5'dia x 50' dp drilled shafts, temp casing, reinf. conc., assume no rock, 7 ea	350	vlf	$1,265.00	$402,500			
Concrete; Shaft Caps	112	cy	$253.00	$28,336			
Fmwk; Shaft Caps	2,016	sfca	$13.29	$26,611			
Reinf; Shaft Caps	9	tn	$2,530.00	$22,669			
Concrete; Column Footings	240	cy	$220.00	$52,800			
Fmwk; Column Footings	2,160	sfca	$8.80	$19,008			
Reinf; Column Footings	19	tn	$2,310.00	$44,352			
Concrete; Slab on Grade	6",471	sf	$9.70	$596,394			
Parking Garage Foundations				**$1,521,698**			
dp column w/ corbel, 30"sq 38'L, 27 ea	238	cy	$880.00	$209,000			
precast I-Beam 2x3 9x130' + 3x480' = 2080lf	580	cy	$825.00	$478,500			
precast deck, 3 lvls, 65' spans e.w., nominal 4" to 5" deck double tee approx 2' tee ht, incls ramps & openings	184,414	sf	$24.20	$4,462,809			
factor deck for ramping around centre station/vendor area- how cars gets around means additional ramping	184,414	sf	$2.23	$496,710			
spandrel deck closures allow 3 levels of perimeter approx 48"H (RS means lists 2.50/sf of floor)	12,744	sf	$33.00	$420,552			
Parking Garage Superstructure				**$5,976,571**			
allow, striping, parking stops, barriers, bollards (means)	236,634	sf	$2.20	$520,595			
deck joint sealers 65'L x (10'w?) precast = 184414/6500x75 + 1062 perim x 3 =	24,464	lf	$1.54	$37,675			
deck expansion joints & cover plates carry 25% of above sealers?	6,000	lf	$29.70	$178,200			
40' roof drain one per 27' column plus allow 80' run, 4" cast iron	3,240	lf	$26.40	$85,536			
allow dry standpipes one per four column? = 7x 50'	350	lf	$46.20	$16,170			
allow 6" fire fill and valve station at g.f.	7	ea	$4,950.00	$34,650			
allow hose wye and valve station 2.5" at each level	28	ea	$1,980.00	$55,440			
allow, fire alarms	236,634	sf	$0.55	$130,149			

Orange Alternative
Cost Estimate Summary

Item	Quantity	Unit	Unit Price	Total	Rounded Total	Add-Ons	Notes
allow, signage	1	alw	$110,000.00	$110,000			
allow, lighting 1w/sf and branch wiring	236,634	sf	$3.30	$780,892			
allow, communications and security	236,634	sf	$0.17	$39,045			
allow, attendant booth, gate, ticket, M&E	2	alw	$22,000.00	$44,000			
Parking Garage Finishes				**$2,032,352**			
CMU stairtower, internal, glazed, typ. footprint assume 48'h 111' perim, 3 ea	15,984	sf	$19.80	$316,483			
Metal pan stairs, lighting, windows	12	flgt	$27,500.00	$330,000			
CMU elevator tower, internal, typ. footprint 48'h w/headhse, 37' perim, 4 ea	7,104	sfca	$16.50	$117,216			
Passenger elevator; 5000 lb incl. lobby finishes, mech rm & headhse roof	4	ea	$185,735.00	$742,940			
Parking Garage Elevator/Stairs				**$1,506,639**			
SUB-TOTAL PARKING GARAGE				**$11,037,260**	**$11,037,300**		
B.3 PLATFORMS							
clear and grub, grading	0.69	ac	$5,500.00	$3,788			
mobilize crane and caisson rigs to far side of platform	1	alw	$55,000.00	$55,000			
Precast Tee platforms, 12' w x1080 lf lg, incl drilled shaft fdns & microsilica topping	2,160	lf	$538.93	$1,164,093			
Platform, Precast (both sides)	2,160	lf	$566.15	**$1,222,881**			
Platform Canopies; Roof over 62% of Platform, standing seam sheetmetal painted, incl support steel & gutters	16,070	sf	$30.60	$491,727			
Platform Fitout; Incl'g timber edging, tactile strip, lighting, speakers, ladders, benches, connector walkways & trash recepticles	2,160	lf	$321.60	$694,656			
Ammenities				**$1,186,383**			
SUB-TOTAL PLATFORMS				**$2,409,264**	**$2,409,300**		
B.4 SITE IMPROVEMENTS							
Site Signage	1	alw	$165,000.00	$165,000			
Site CCTV	1	alw	$132,000.00	$132,000			
Site Lighting	1	alw	$334,400.00	$334,400			
Site Improvements Allowance				**$631,400**			
Site Improvements; including bicycle racks, LED signage, anti-graffiti coatings, bird control & bollards	1	alw	$344,630.00	$344,630			
Garage area- paved walk to N, up to 529-space lot	28,867	sf	$2.64	$76,210			
Site Improvements (MNRR items)				**$420,840**			
SUB-TOTAL SITE IMPROVEMENTS				**$1,052,240**	**$1,052,200**		
B.5 CROSS-TRACK PEDESTRIAN ACCESS							
Pedestrian Stair/ Elevator Structure; Includes one (1) exterior elevator/stair tower on south side from platform level to Ped. Tunnel, elevator (2 stop) & stairway.	1	ls	$411,809.20	$411,809			
Jacked Tunnel Rail Stabilization	1	ls	$668,000.00	$668,000			
Jacked Pedestrian Tunnel	90	lf	$14,352.79	$1,291,751			
SUB-TOTAL CROSS-TRACK PEDESTRIAN ACCESS				**$2,371,560**	**$2,371,600**		
ARCHITECTURAL ELEMENT TOTAL				**$17,629,324**	**$17,629,400**	**$5,641,400**	
C. SITE ELEMENTS							
C.1 SITE DRAINAGE							
Stormwater Detention Allowance; site retention pond	1	alw	$278,190.00	$278,190			
Drainage culvert and headwalls below proposed access road; allowance	1	alw	$33,000.00	$33,000			
allowance to re-route apparent protected wetland drainage below site of garage	1,200	lf	$99.00	$118,800			
foundation perimeter/ underdrains, carry at parking structure which is low point	960	lf	$26.40	$25,344			
area of Culvert Impact (proposed road)	6,490	sf	$1.10	$7,139			
Catch Basins; Access Road & Surface Parking Lots	12	ea	$3,300.00	$39,600			
RCP Drains; Access Road & Surface Parking Lots	3,580	lf	$44.00	$157,520			
SUB-TOTAL SITE DRAINAGE				**$659,593**	**$659,600**		
C.2 SITE UTILITIES							
Sanitary Drainage System; allow 200lf pipe & 3 ea SMDH	1	alw	$24,860.00	$24,860			
Gas Main; allow 1,850 lf 4" HPDE & 2 ea gas gates	1	alw	$166,760.00	$166,760			
Water Main; 1,800 lf 8" DICL & Water/Fire Mains, 600 lf 4" DICL, incl'g valvs & figs	1	alw	$251,680.00	$251,680			
Electric Ductbank; 1,800 lf, 4x4" & 2 ea EMH's	1	alw	$251,900.00	$251,900			
Electrical Transformer	1	ea	$88,000.00	$88,000			
Comm/Fiber Ductbank; 1,800 lf, 4x4" & MH's	1	alw	$225,720.00	$225,720			
SUB-TOTAL SITE UTILITIES				**$1,008,920**	**$1,008,900**		
C.3 SITE WORK							

Orange Alternative
Cost Estimate Summary

Item	Quantity	Unit	Unit Price	Total	Rounded Total	Add-Ons	Notes
temp access road for south precast platform side-distance unknown, buys reused ballast or crushed stone; gates; clearing, assume unpaved	1	alw	$55,000.00	$55,000			
temp laydown area, gravel bed, for precast sections, allow	1	alw	$3,462.80	$3,463			
Site earthwork incl. 75,559 cy of cuts, 52,363 tons off site disposal, and 10,290 cy imported backfill	1	alw	$2,297,755.90	$2,297,756			
dewatering, stockpile handling, soil testing allowance	1	alw	$114,887.30	$114,887			
temp fencing incl. 6,000 lf of fence, 2 pair of 12' wide gates, 4 pair of 5' wide gates	1	alw	$65,560.00	$65,560			
site survey	10	wks	$7,040.00	$70,400			
SUB-TOTAL SITE WORK				**$2,607,066**	**$2,607,100**		
C.4 PARKING AND ROADS							
clear and grub	8.40	ac	$5,500.00	$46,219			
sawcut asphalt	100	lf	$4.40	$440			
Curbcut, existing road	1	pr	$385.00	$385			
demol asphalt incl. subbase, roadway and sidewalks	1	alw	$60,413.10	$60,413			
Loam and seed	53,137	sf	$0.66	$35,070			
landscaping incl. plantings,sod and planters	1	alw	$58,278.00	$58,278			
temp traffic control incl. temporary signs	1	alw	$5,500.00	$5,500			
Utility work incl. overhead line and pole work and drainage	1	alw	$23,250.70	$23,251			
demol curbing, various kinds	1	alw	$7,895.80	$7,896			
Sidewalks	1	alw	$120,373.00	$120,373			
Imported 8" gravel subbase	503	cy	$41.80	$21,033			
paving 3.5" binder and top	390	tn	$88.00	$34,304			
striping incl. roadway center, side lines, parking slots and diagonal striping	1	alw	$9,055.20	$9,055			
Paving and subbase	325,696	sf	$2.54	$827,593			
Precast curbing	6,186	lf	$35.20	$217,741			
signage	1	alw	$1,100.00	$1,100			
allow guardrails at steep areas, assume metal preformed rail on augured wood posts	947	lf	$192.50	$182,227			
SUB-TOTAL PARKING AND ROADS				**$1,650,877**	**$1,650,900**		
SITE ELEMENT TOTAL				**$5,926,456**	**$5,926,500**	**$1,896,500**	
D. OFF-SITE IMPROVEMENTS							
Marsh Hill @ Site Driveway	1	LS	$143,220.00	$143,220			
SUB-TOTAL OFF-SITE IMPROVEMENTS				**$143,220**	**$143,200**		**$189,000**
OFF-SITE IMPROVEMENTS TOTAL				**$143,220**	**$143,200**	**$45,800**	
E. GENERAL CONDITIONS							
E.1 General Conditions							
Jobsite Supervision	110	mo	$9,807.47	$1,078,822			
Jobsite Trailer incl. utilities & supplies	24	mo	$1,595.00	$38,280			
Jobsite Contract Procedures incl'g safety cert. progress photos, dwgs, repro & manuals	24	mo	$1,242.08	$29,810			
Construction equip. incl. pick-up, crane, street sweeper, forklift, etc.	1	alw	$1,102,235.20	$1,102,235			
hi-rail pickup for goods transport to railwork	7	mo	$3,891.36	$27,240			
SUB-TOTAL GENERAL CONDITIONS				**$2,276,386**	**$2,276,400**		**$3,004,800**
GENERAL CONDITIONS TOTAL				**$2,276,386**	**$2,276,400**	**$728,400**	
TOTAL				**$40,311,761**	**$40,311,900**		
ADD ONS				**$12,899,764**	**$12,899,700**		
TOTAL COST W/ADD ONS				**$53,211,525**	**$53,212,000**		

West Haven Alternative
Cost Estimate Summary

Item	Quantity	Unit	Unit Price	Total	Rounded Total	Add-Ons	Notes
A. RAIL ELEMENTS							
A.1 TRACKWORK							
track ballast protection during platform construction, 1080lf x 45'w	49,680	sf	$0.11	$ 5,465			
drainage ditch clear and maintain (2 side)	11,600	lf	$5.50	$ 63,800			
mobilize hirail equipment and provide temp access and wetlands protections	1	alw	$55,000.00	$ 55,000			
Track Protection & Maintenance				$124,265			
demol track #1, replaced by crossovers	500	tkft	$68.20	$ 34,100			
demol. track #5 between crossovers	5,800	tkft	$95.70	$ 555,060			
Track Demolition				$589,160			
new #5 continuous welded rail 140RE CWR, ballast, concrete ties	5,300	tkft	$331.10	$ 1,754,830			
tamp and align track #1 adjacent to new crossovers, supplement ballast- per VHB 11-10-04	400	tkft	$96.80	$ 38,720			
Track- New & Rework				$1,793,550			
No. 20 Crossover- (pg.30), Track 1/5, frog & switch including assumed 250 lf area ea. of tie and track premiums	2	alw	$330,000.00	$ 660,000			
Track Crossover 250 tkft ea				$660,000			
SUB-TOTALTRACKWORK				$3,166,975	$3,167,000		
A.2 ELECTRIFICATION							
motorized catenary disconnect switch at crossovers	2	ea	$27,500.00	$ 55,000			
catenary crossover, assume 300 lf ea	600	lf	$110.00	$ 66,000			
new catenary at track five	5,500	lf	$99.00	$ 544,500			
energize 2 switches	2	alw	$11,000.00	$ 22,000			
SUB-TOTAL ELECTRIFICATION				$687,500	$687,500		
A.3 RELOCATION OF TRANSMISSION LINES							
rehang utilites on catenary & new poles	1,200	lf	$110.00	$ 132,000			
new poles supporting elevated utilities	3	ea	$38,500.00	$ 115,500			
SUB-TOTAL TRACK UTILITY RELOCATION				$ 247,500	$247,500		
A.4 SIGNAL AND COMMUNICATIONS							
SIGNAL AND COMMUNICATIONS PER CONTROL POINT	2	alw	$6,050,000.00	$ 12,100,000			
SUB-TOTAL SIGNAL & COMMUNICATIONS				$12,100,000	$12,100,000		
RAIL ELEMENT TOTAL				$16,201,975	$16,202,000	$5,184,600	
B. ARCHITECTURAL ELEMENTS							
B.1 STATION AND VENDOR AREA							
Station area, stand alone structure	3,147	sfca	$308.00	$ 969,160			
Vendor areas							No separate area
SUB-TOTAL STATION AND VENDING AREA				$969,160	$969,200		
B.2 PARKING GARAGE (470 SPACES)							
Excavation, Earth	1,880	cy	$11.00	$ 20,675			
Backfill, Gravel	2,925	cy	$30.80	$ 90,077			
Concrete; Grade Beams & Frost Wall	385	cy	$209.00	$ 80,504			
Frmwk; Grade Beams & Frost Wall	14,560	sfca	$5.50	$ 80,080			
Reinf; Grade Beams & Frost Wall	31	tn	$2,310.00	$ 71,182			
Concrete; Column Footings	436	cy	$220.00	$ 95,920			
Frmwk; Column Footings	3,384	sfca	$8.80	$ 29,779			
Reinf; Column Footings	35	tn	$2,310.00	$ 80,573			
Concrete; Slab on Grade	1,313	cy	$209.00	$ 274,394			
Frmwk; Slab on Grade	1,100	sfca	$3.85	$ 4,235			
Reinf; Slab on Grade	35	tn	$2,310.00	$ 80,934			
screed float and cure	50,388	sf	$1.43	$ 72,055			
Parking Garage Foundations				$ 980,409			
cip columns w/ corbel, 30"sq. 38'L, 21 ea	185	cy	$880.00	$ 162,556			
precast I-Beam 2x3 7x130' + 3x390' = 2080lf	462	cy	$825.00	$ 381,333			
precast deck, 3 lvls, 65' spans e.w., nominal 4" to 5" ceck double tee approx 2' tee ht, incls ramps & openings	151,164	sf	$24.20	$ 3,658,169			
spandrel deck closures allow 3 levels of perimeter approx 48"H	12,480	sf	$33.00	$ 411,840			
Parking Garage Superstructure				$ 4,613,898			
allow, striping, parking stops, barriers, bollards	201,552	sf	$2.20	$ 443,414			
deck joint sealers 65'L x (10'w) precast = 201552/650x75 + 1040 perim x 3 =	26,376	lf	$1.54	$ 40,619			
deck expansion joints carry 25% of above sealers	6,500	lf	$29.70	$ 193,050			
40' roof drain one per 21 column plus allow 80' run, 4" cast iron	2,520	lf	$26.40	$ 66,528			
allow dry standpipes one per four column = 6x 50'	300	lf	$46.20	$ 13,860			
allow 6" fire fill and valve station at g.l.	6	ea	$4,950.00	$ 29,700			
allow hose wye and valve station 2 5" at each level	24	ea	$1,980.00	$ 47,520			
allow, fire alarms	201,552	sf	$0.55	$ 110,854			
allow, signage	1	alw	$110,000.00	$ 110,000			
allow, lighting 1w/sf and branch wiring	201,552	sf	$3.30	$ 665,122			
allow, communications and security	201,552	sf	$0.17	$ 33,256			
allow, attendant booth, gate, ticket, M&E	2	alw	$22,000.00	$ 44,000			
Parking Garage Finishes				$1,797,923			
CMU stairtower, internal, glazed; 2 ea, assume 48'h 111' perim ea	10,656	sfca	$19.80	$ 210,989			
Metal pan stairs and rails	8	flgt	$19,800.00	$ 158,400			

West Haven Alternative
Cost Estimate Summary

Item	Quantity	Unit	Unit Price	Total	Rounded Total	Add-Ons	Notes
Lighting, glazing, fire alarm & sprinkler allowance	4,000	sf	$22.00	$ 88,000			
Internal CMU elevator tower, 4 level + headhouse = 48'h 82'perim, 1 ea	1,776	sfca	$16.50	$ 29,304			
Passenger elevator; 5000 lb incl. lobby finishes, mech rm & headhouse	1	ea	$216,480.00	$ 216,480			
Parking Garage Elevator/Stairs				$ 703,173			
SUB-TOTAL PARKING GARAGE				**$8,095,402**	**$8,095,400**		
B.3 PLATFORMS							
NORTH SIDE: CAST IN PLACE SCENARIO							
Drilled Shafts, temp casing, reinf conc, 55ea, 30"d x 10'dp - assume no rock	550	vlf	$357.50	$ 196,625			
Frmwk; Grade Beam	8,640	sf	$6.60	$ 57,024			
Conc Gr Beam; 1080 lf 3'w x 8'dp CIP	960	cy	$209.00	$ 200,640			
Reinf; Grade Beam, 160 lb/cy	77	tn	$2,310.00	$ 177,408			
Excavation	2,240	cy	$11.00	$ 24,640			
Backfill; assume suitable	1,280	cy	$8.80	$ 11,264			
Sheetpile trackside, 15', x 1080, left in place frmwk for grade beam	16,200	sf	$23.10	$ 374,220			
CIP platform 8" x 12'w, 4ksi 1080 lf, w/ microsilica topping	12,960	sf	$11.55	$ 149,688			
Platform, Northside	2,160	lf	$551.62	$ 1,191,509			
SOUTH PLATFORM: PRECAST TEES							
Precast Tee platform, 12' w x1080 lf lg, incl drilled shaft fdns & microsilica topping	1,080	lf	$538.93	$ 582,047			
Platform, Southside	2,160	lf	$269.47	$ 582,047			
Platform Canopies; Roof over 62% of Platform, standing seam sheetmetal painted, incl support steel & gutters	16,070	sf	$30.60	$ 491,727			
Platform Fitout; Incl'g timber edging, tactile strip, lighting, speakers, ladders, benches, connector walkways & trash recepticles	2,160	lf	$321.60	$ 694,656			
Ammenities				$1,186,383			
SUB-TOTAL PLATFORMS				$ 2,959,938	$2,959,900		
B.4 SITE IMPROVEMENTS							
Site Signage	1	alw	$165,000.00	$ 165,000			
Site CCTV	1	alw	$132,000.00	$ 132,000			
Site Lighting	1	alw	$334,400.00	$ 334,400			
Site Improvements Allowance				$ 631,400			
Site Improvements (MNRR items)	1	alw	$344,630.00	$ 344,630			
Site Improvements (MNRR items)				$344,630			
SUB-TOTAL SITE IMPROVEMENTS				$ 976,030	$976,000		
B.5 CROSS-TRACK PEDESTRIAN ACCESS							
Pedestrian Stair/ Elevator Structures; Includes two (2) exterior elevator/stair towers to elevated crossover, elevators (3 stop each) & stairs	1	ls	$1,089,847.00	$ 1,089,847			
Pedestrian Bridge	90	lf	$3,481.62	$ 313,346			
SUB-TOTAL CROSS-TRACK PEDESTRIAN ACCESS				$1,403,193	$1,403,200		
ARCHITECTURAL ELEMENT TOTAL				$14,403,723	$14,403,700	$4,609,200	
C SITE ELEMENTS							
C.1 SITE DRAINAGE							
Site Drainage Allowance; redirection & connection to sewer system	1	alw	$110,000.00	$ 110,000			
Catch Basins; Access Road & Surface Parking Lots	13	ea	$3,650.00	$ 50,050			
RCP Drains; Access Road & Surface Parking Lots	2,200	lf	$44.00	$ 96,800			
SUB-TOTAL SITE DRAINAGE				$ 256,850	$256,900		
C.2 SITE UTILITIES							
Sanitary Drainage System; allow 300lf pipe & 2 ea SMDH	1	alw	$23,540.00	$ 23,540			
Gas Main; allow 300 lf 4" HPDE & 2 ea gas gates	1	alw	$30,360.00	$ 30,360			
Water Main; 350 lf 8" DICL & Water/Fire Mains, 100 lf 4" DICL, incl'g valvs & flgs	1	alw	$75,130.00	$ 75,130			
Electric Duct; 300 lf, 4x4" & 2 ea EMH's	1	alw	$53,900.00	$ 53,900			
Electrical Transformer	1	ea	$88,000.00	$ 88,000			
Comm/Fiber Ductbank; 300 lf, 4x4" & MH's	1	alw	$40,260.00	$ 40,260			
SUB-TOTAL SITE UTILITIES				$311,190	$311,200		
C.3 SITE WORK							
mobilize crane and caisson rigs to far side of platform	1	alw	$33,000.00	$ 33,000			
temp laydown area, gravel bed, for precast sections, allow	1	alw	$2,852.30	$ 2,852			
Site earthwork incl. 20,639 cy rough grading and 445,794 sf fine gading	1	alw	$408,483.00	$ 408,483			
haybale and siltfence, carry at structures only, allow 300 lf for CB's	2,000.0	lf	$2.75	$ 5,500			
dewatering, stockpile handling, soil testing allowance	1	alw	$55,000.00	$ 55,000			
temp fencing incl. 5,900 lf of fence, 3 pair of 12' wide gates, 6 pair of 5' wide gates	1	alw	$69,355.00	$ 69,355			
site survey	10	wks	$7,040.00	$ 70,400			
SUB-TOTAL SITE WORK				$ 644,570	$644,600		

West Haven Alternative
Cost Estimate Summary

Item	Quantity	Unit	Unit Price	Total	Rounded Total	Add-Ons	Notes
C.4 PARKING AND ROADS							
sawcut asphalt	33*	lf	$4.40	$ 1,456			
cold planing	82,252	sf	$2.20	$ 180,954			
Curbcut, existing road	7	pr	$385.00	$ 2,695			
1.5" asphalt topping	780.4	tn	$90.20	$ 70,392			
2.5" asphalt topping	3.8	tn	$86.90	$ 330			
loam and seed	105,143	sf	$0.66	$ 69,394			
landscaping incl. plantings,soil and planters	1	alw	$16,204.10	$ 16,204			
temp traffic control	1	alw	$17,248.00	$ 17,248			
Utility work incl. overhead line and pole work	1	alw	$33,000.00	$ 33,000			
demol curbing, various kinds	1	alw	$1,768.80	$ 1,769			
Reset MH, CB and utility covers	1	alw	$16,500.00	$ 16,500			
striping incl. roadway center, side lines and parking slots	1	alw	$17,595.60	$ 17,596			
Sidewalks	1	alw	$89,870.00	$ 89,870			
Paving and subbase	211,060	sf	$2.54	$ 536,303			
precast curbing	9,671	lf	$35.20	$ 340,419			
concreted center islands	1	alw	$69,341.80	$ 69,342			
signage	1	alw	$8.80	$ 9			
SUB-TOTAL PARKING AND ROADS				**$1,463,482**	**$1,463,500**		
SITE ELEMENT TOTAL				**$ 2,676,093**	**$ 2,676,200**	**$856,300**	
D OFF-SITE IMPROVEMENTS							
Rte 162 @ Railroad Avenue	1	LS	$221,540.00	$221,540			
Rte 162 @ Hood Terrace	1	LS	$143,220.00	$143,220			
SUB-TOTAL OFF-SITE IMPROVEMENTS				**$364,760**	**$364,800**		**$481,500**
OFF-SITE IMPROVEMENTS TOTAL				**$364,760**	**$364,800**	**$116,700**	
E GENERAL CONDITIONS							
E.1 General Conditions							
Jobsite Supervision	110	mo	$9,807.47	$ 1,078,822			
Jobsite Trailer incl. utilities & supplies	24	mo	$1,595.00	$ 38,280			
Jobsite Contract Procedures incl'g safety cert., progress photos, dwgs, repro & manuals	24	mo	$1,242.08	$ 29,810			
Construction equip. incl. pick-up, crane, street sweeper, forklift, etc.	*	alw	$1,102,235.20	$ 1,102,235			
hi-rail pickup for goods transport to railwork	8	mo	$3,891.36	$ 31,131			
SUB-TOTAL GENERAL CONDITIONS				**$2,280,278**	**$2,280,300**		**$3,010,000**
GENERAL CONDITIONS TOTAL				**$2,280,278**	**$2,280,300**	**$729,700**	
TOTAL				**$35,926,828**	**$35,927,000**		
ADD ONS				**$11,496,585**	**$11,496,500**		
TOTAL COST W/ADD ONS				**$47,423,412**	**$47,423,000**		

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
02200 EARTHWORK				
Newburyport Station, East Parking Lot				
Strip Topsoil and Stockpile	2,404	CY	1.20	$2,885
Site Excavation, Cut to Fill	759	CY	0.90	683
Compacted Borrow, 3021 CY +15%	2,344	CY	14.80	34,691
Site Grading, Rough	13,470	SY	0.80	10,776
Excavate for Catch Basins and Manholes	87	CY	6.90	600
Excavate for Drainage Pipe	502	CY	8.90	4,468
Backfill for Drainage Pipe	395	CY	4.90	1,936
Pipe Bedding	59	CY	10.40	614
Lightpole Excavation, 24 EA X 7 CY	168	CY	8.70	1,462
Backfill and Compaction, 24 EA X 6 CY	144	CY	15.50	2,232
Conduit Excavation and Backfill, Circuit # 1	3,190	LF	3.30	10,527
Excavate & Backfill Manhole & Duct	72	CY	28.50	2,052
TOTAL, Newburyport Station, East Parking Lot			0.00	72,925
Newburyport Station, West Parking Lot				
Strip Topsoil and Stockpile	2,761	CY	1.20	3,313
Site Excavation, Cut to Fill	747	CY	0.90	672
Compacted Borrow, 24,650 CY +15%	17,493	CY	14.80	258,896
Site Grading, Rough	14,360	SY	0.80	11,488
Excavate for Catch Basins & Manholes	95	CY	6.90	656
Excavate & Backfill for Drainage Pipe	1,097	CY	8.90	9,763
Backfill for Drainage Pipe	961	CY	4.90	4,709
Pipe Bedding	75	CY	10.40	780
Lightpole Excavation, 31 EA X 7 CY	217	CY	8.70	1,888
Backfill and Compaction, 31 EA X 6 CY	186	CY	15.50	2,883
Conduit Excavation and Backfill, Circuit # 2	2,505	LF	3.30	8,267
TOTAL, Newburyport Station, West Parking Lot			0.00	303,315
			0.00	
Newburyport Station, Platform			0.00	
Strip Topsoil & Stockpile	1,070	CY	1.20	1,284
Footing Excavation ≈ $18.60/FT (800')	1,225	CY	2.40	2,940
Backfill (28.3 X 35)	991	CY	1.50	1,487
Excess Material	234	CY	4.50	1,053
Site Grading, Rough	6420	SY	0.80	5,136
Conduit Excavation and Backfill - Circuit #4 & #5	900	LF	3.30	2,970
TOTAL, Newburyport Station, Platform			0.00	14,870
			0.00	
Track & Layover Civil Work			0.00	
Grading & Finishing	1	LS	230,600.00	230,600
Fine Grading & Compaction Subgrade Areas	1	LS	228,080.00	228,080
Unclassified Excavation	48,000	CY	7.00	336,000
Gravel Borrow	5,200	CY	39.15	203,580
Rock Excavation, Class A	276	CY	100.00	27,600
Rock Excavation, Class B	1,845	CY	125.00	230,625
TOTAL, Track & Layover Civil Work			0.00	1,256,485
			0.00	
			0.00	
			0.00	
			0.00	
			0.00	
			0.00	
			0.00	
			0.00	
			0.00	
			0.00	
			0.00	
			0.00	
			0.00	
			0.00	
			0.00	
			0.00	
SUBTOTAL, 02200 EARTHWORK			0.00	**$1,647,594**

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
02200 EARTHWORK, brought forward				**$1,647,594**
Rowley Station, Parking Lot				
Strip Topsoil and Stockpile	2,214	CY	1.20	2,657
Site Excavation, Cut to Fill	375	CY	0.90	338
Compacted Fill	100	CY	14.80	1,480
Site Grading, Rough	12,756	SY	0.80	10,205
Excavate & Backfill for Catch Basins & Manholes	80	CY	6.90	552
Sidewalk - Bituminous Concrete	264	SY	5.50	1,452
Sidewalk - Sub-Base	264	SY	9.90	2,614
Slotted Concrete Panel w/ Access Rim & Cover	1	EA	250.00	250
Relocate Sign	1	EA	30.00	30
Temporary Support of Utility Poles	3	EA	125.00	375
Excavate & Backfill for Drainage Pipe	2,100	CY	8.90	18,690
Pipe Bedding	194	CY	10.40	2,018
Lightpole Excavation, 21 EA X 7 CY	147	CY	8.70	1,279
Backfill and Compaction, 21 EA X 6 CY	126	CY	15.50	1,953
Conduit Excavation and Backfill, Circuit # 1	2,115	LF	3.30	6,980
TOTAL, Rowley Station, Parking Lot			0.00	50,871
			0.00	
Rowley Station, Platform			0.00	
Strip Topsoil & Stockpile	1,070	CY	1.20	1,284
Footing Excavation ≈ $18.07/FT	1,155	CY	2.40	2,772
Backfill (28.3 X 35)	934	CY	1.50	1,401
Excess Material	221	CY	4.50	995
Site Grading, Rough	6,420	SY	0.80	5,136
Conduit Excavation and Backfill Circuit #2	870	LF	3.30	2,871
TOTAL, Rowley Station, Platform			0.00	14,459
			0.00	
Layover Facility			0.00	
Strip Topsoil & Stockpile	42	CY	1.20	50
Earth Excavation to Subgrade	90	CY	3.90	351
Footing Excavation	235	CY	2.40	564
Backfill & Compaction	179	CY	1.50	269
6" Compacted Gravel Under Slab	28	CY	17.60	493
TOTAL, Layover Facility				1,727
Muddy Run Creek Bridge #1				
Abutment Excavation	302	CY	6.50	1,963
Wing Wall Excavation	226	CY	6.50	1,469
Pile Caps - Excavation	278	CY	6.50	1,807
Trim Sides & Bottom for Pile Caps	1,228	SF	17.20	21,122
Dozer Backfill & Roller Compaction	216	CY	4.60	994
Abutment Backfill, Compacted, 6" Layers	475	CY	17.90	8,503
TOTAL, Muddy River Creek Bridge #1			0.00	35,857
			0.00	
Muddy Run Creek Bridge #2			0.00	
Abutment Excavation	302	CY	6.50	1,963
Wing Wall Excavation	226	CY	6.50	1,469
Pile Caps - Excavation	278	CY	6.50	1,807
Trim Sides & Bottom for Pile Caps	1,228	SF	17.20	21,122
Dozer Backfill & Roller Compaction	216	CY	4.60	994
Abutment Backfill, Compacted, 6" Layers	475	CY	17.90	8,503
TOTAL, Muddy River Creek Bridge #2			0.00	35,857
			0.00	
			0.00	
			0.00	
			0.00	
			0.00	
			0.00	

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
03314 PRECAST PRESTRESSED CONCRETE UNITS				
Concrete Box Girders				
Muddy Run Creek Bridge #1				
3'-6" W X 2'-9" D X 36'-0" LG	8	EA	6,547.00	$52,376
			0.00	
Muddy Run Creek Bridge #2			0.00	
3'-6" W X 2'-9" D X 36'-0" LG	8	EA	6,547.00	52,376
			0.00	
Rowley River Bridge			0.00	
3'-6" W X 4'-0" D X 65'-0" LG	8	EA	14,263.00	114,104
			0.00	
Parker River Bridge			0.00	
Spans 1 & 4, 3'-6" W X 3'-6" D X 44'-11" LG	16	EA	9,198.00	147,168
Span 2, 3'-6" W X 3'-6" D X 44'-11" LG	8	EA	9,405.00	75,240
Span 3, 7'-0" W X 2'-3" D X 29'-7"	4	EA	8,009.00	32,036
			0.00	
TOTAL, 03314 Precast Prestressed Concrete Units			0.00	**$473,300**
			0.00	
03400 PRECAST CONCRETE			0.00	
			0.00	
			0.00	
Newburyport Station Platform			0.00	
Beams, 2'-0" D X 1'-3" W X 24'-0" LG	68	EA	3,049.00	207,332
Beams, 2'-0" D X 1'-3" W X 16'-0" LG	2	EA	2,033.00	4,066
Platform Plank, 22'-0" X 8'-0"	104	EA	3,998.00	415,792
Extra for Integral 24" Tactile Strip	1,664	LF	15.50	25,792
12" SQ X 4'-0" H Column Base for Canopy	9	EA	453.00	4,077
Splash Blocks	16	EA	78.00	1,248
24" X Beam @ Ramp X 25'-0"	4	EA	3,172.00	12,688
24" X Beam @ Ramp X 50'-0" ≈ 887/FT	2	EA	647.00	1,294
Ramp Deck 7'-6" X 25'-0"	2	EA	4,259.00	8,518
Ramp Deck 7'-6" X 50'-0"	1	EA	854.00	854
Precast Concrete Stairs, 6R X 7'-8"	46	LF/R	58.00	2,668
Allow for Bench/Windscreens	7	EA	3,237.00	22,659
Allow For Trash Cans, 30" DIAM	7	EA	324.00	2,268
TOTAL, Newburyport Station			0.00	709,256
			0.00	
Rowley Station Platform			0.00	
Beams, 2'-0" DEEP X 1'-3" W X 24'-0" LG	64	EA	3,049.00	195,136
Beams, 2'-0" DEEP X 1'-3" W X 16'-0" LG	4	EA	2,033.00	8,132
Platform Plank, 22'-0" X 8'-0" ≈ 825/FT	100	EA	3,998.00	399,800
Extra for Integral 24" Tactile Strip	800	LF	15.50	12,400
12" SQ X 4'-0" H Column Base for Canopy	12	EA	453.00	5,436
Splash Blocks	8	EA	78.00	624
Bench / Windscreens	11	EA	3,237.00	35,607
Trash Cans, 30" DIAM	11	EA	324.00	3,564
TOTAL, Rowley Station Platform			0.00	660,699
			0.00	
Rowley River Bridge				
Precast Concrete for Retainer Wall	3,408	SF	30.00	102,240
Parker River Bridge				
Precast Concrete for Retainer Wall	3,116	SF	30.00	93,480
Track & Layover Civil Work				
Precast Concrete - Curbing	230	LF	9.70	2,231
TOTAL, 03400 PRECAST CONCRETE			0.00	**$1,567,906**
			0.00	
			0.00	
			0.00	
			0.00	
			0.00	
			0.00	

"Neil Levitt"
<nlevitt@dhkinc.com>
09/18/2006 10:25 AM

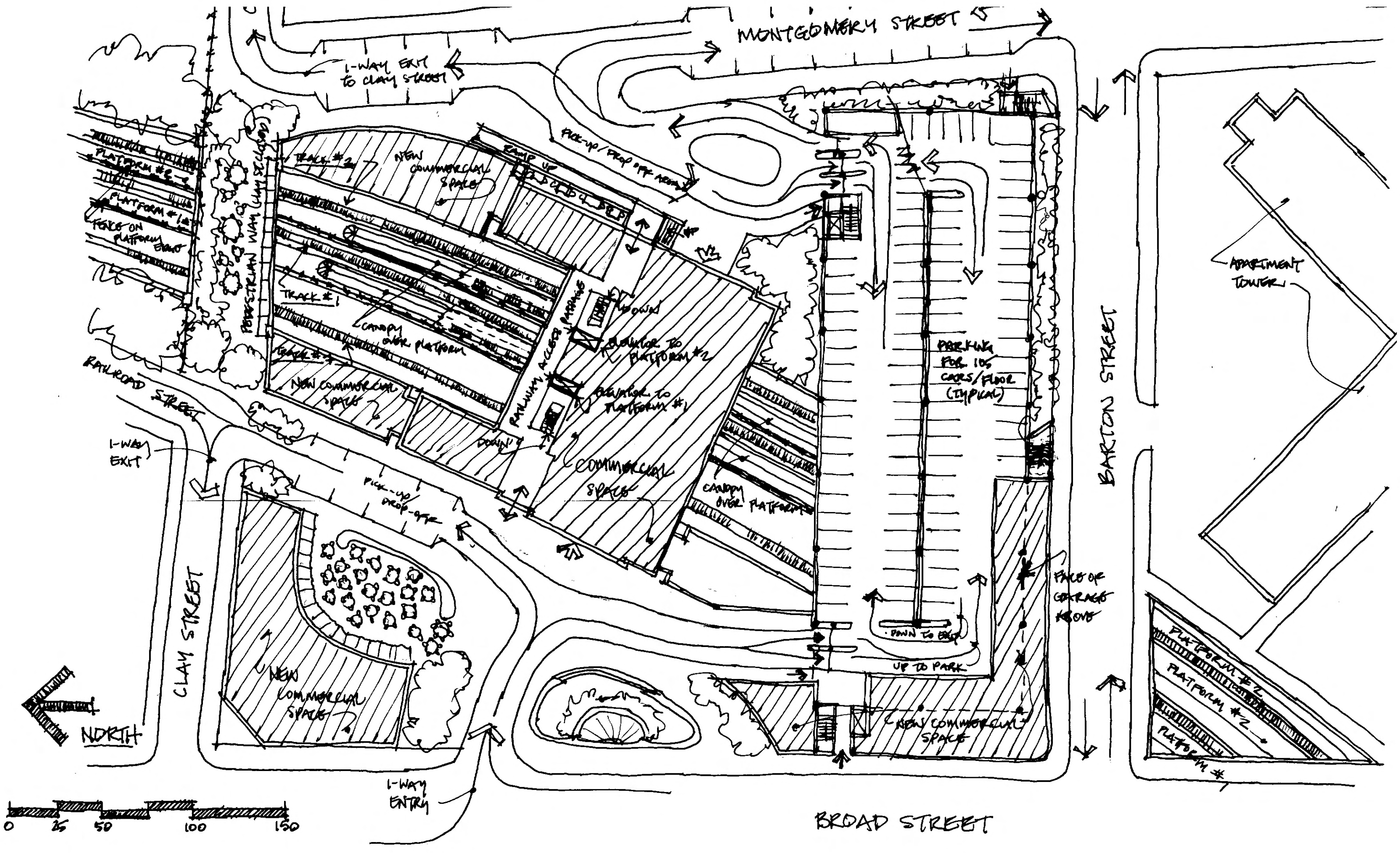
To "Wilcock, David" <DWilcock@VHB.com>, <doug_peterson@urscorp.com>, <Jack_Cash@URSCorp.com>, <MMcardle@VHB.com>,
cc "Mickey Krockmalnic" <mkrockmalnic@dhkinc.com>
bcc
Subject Site Plans for Pawtucket/Central Falls Station

David, Doug, Jack, Mike, et. al.

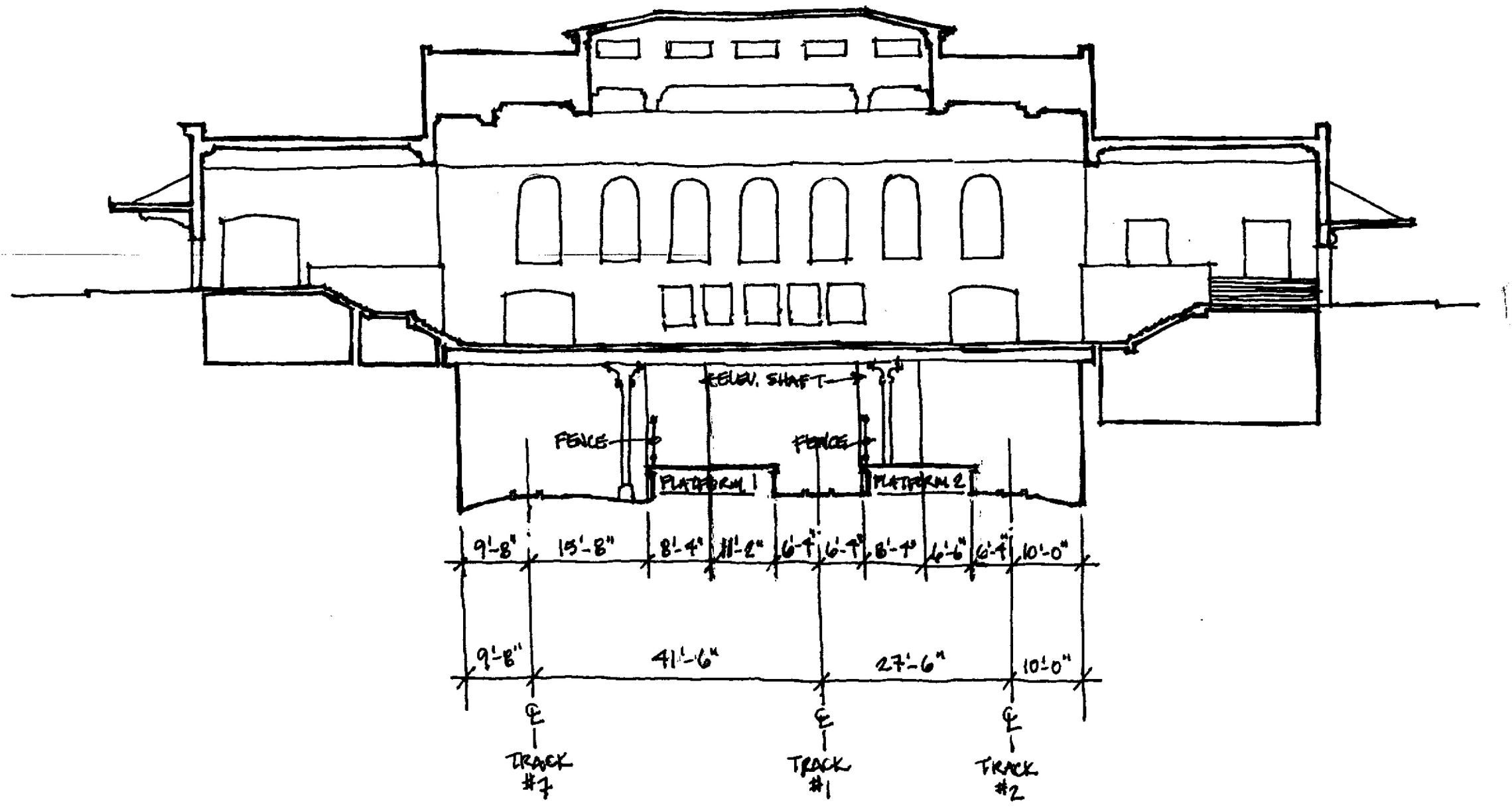
Attached are the sketch site plans for Options 1, 2, and 3 for the Pawtucket/Central Falls Station. The sections will follow a little later.

Please keep in mind that, since there is no site survey for the P&W yard, we have made some assumptions about the height of the Conant Street Bridge--based on the clearance requirements for the trains plus an allowance for structure below the deck surface we allowed about 24 feet together. At this scale and at this level of development, these assumptions should be adequate.

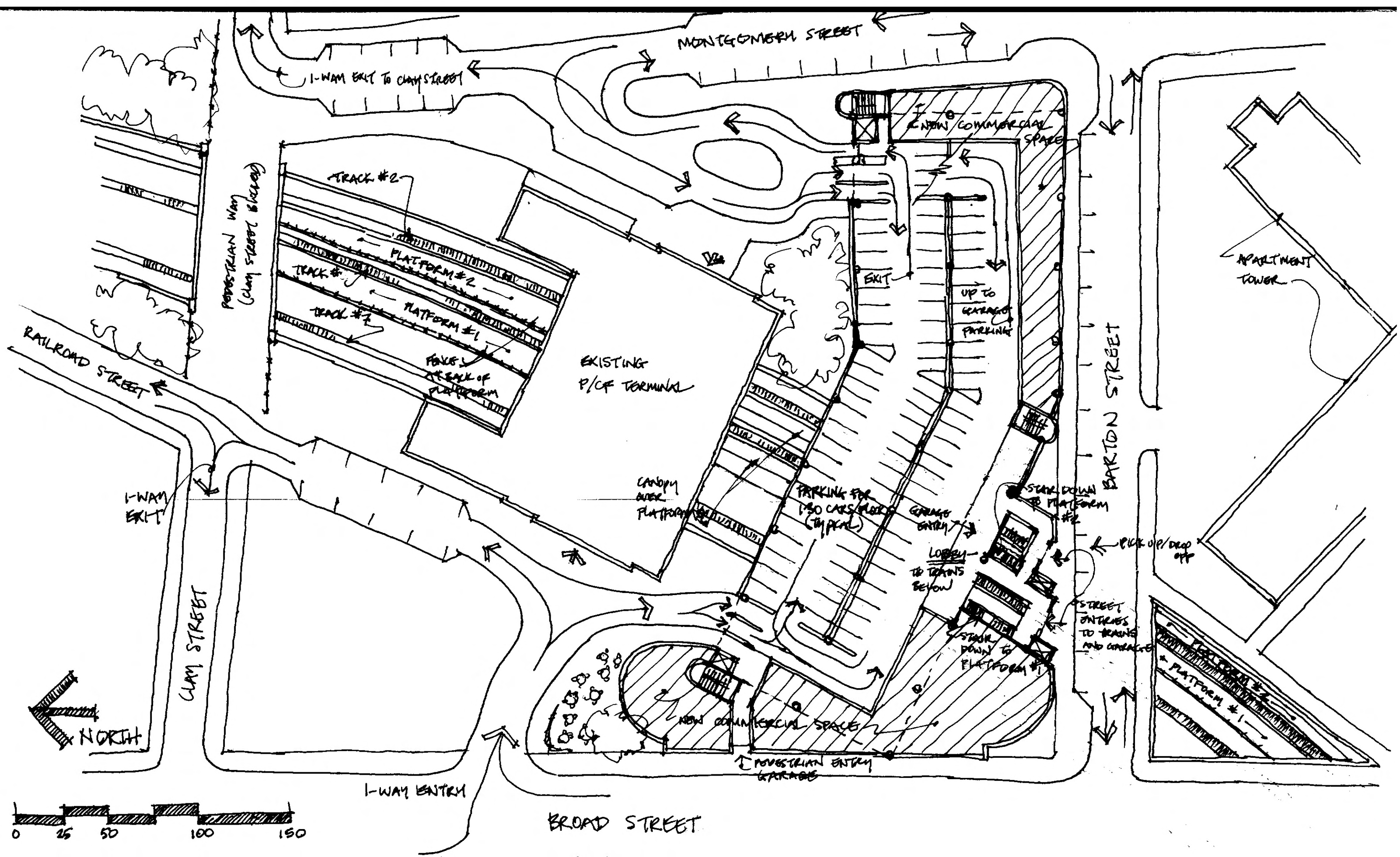
Neil Opt. 1_Reuse Exist Terminal.pdf Opt. 2_Entry thru New Garage.pdf Opt. 3_P&W Yard.pdf



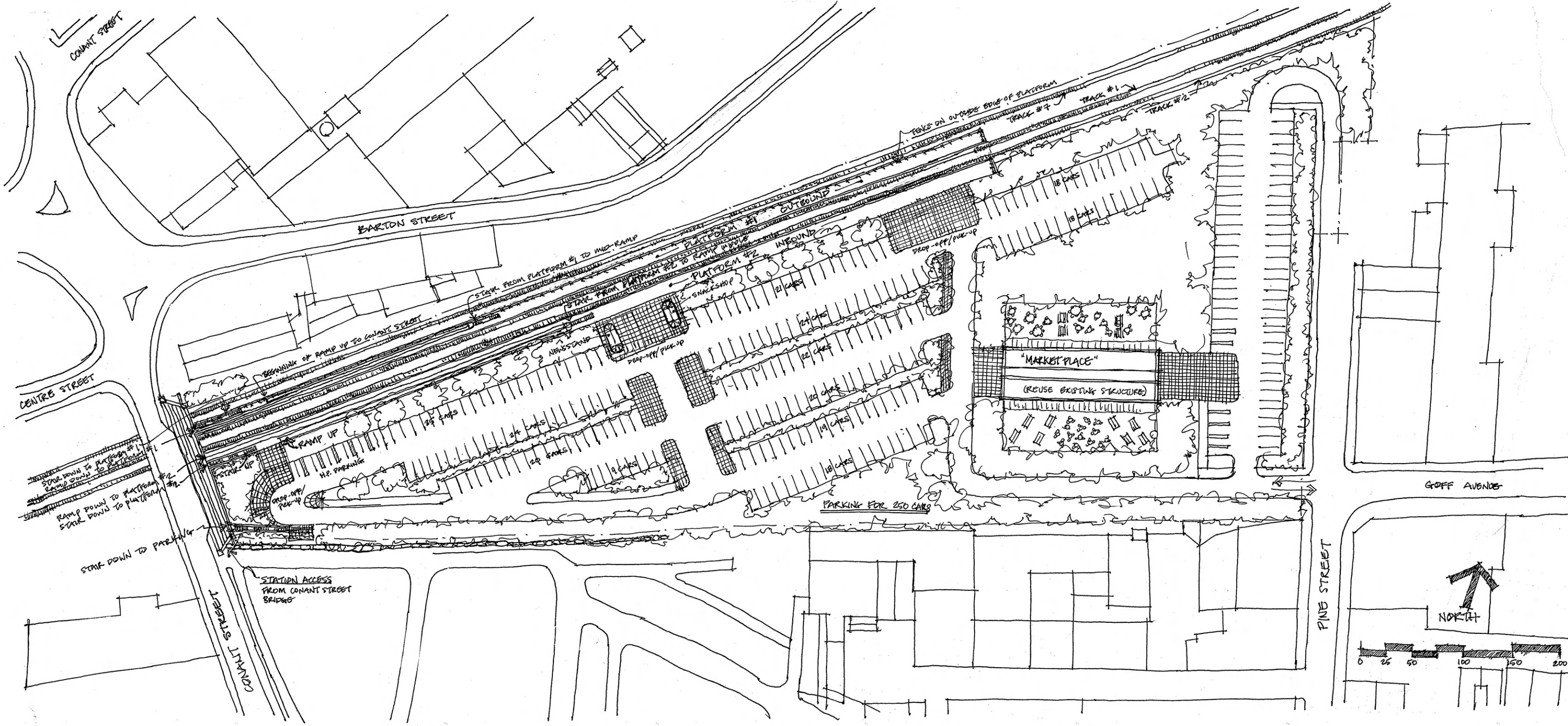
PAWTUCKET/ CENTRAL FALLS - EXISTING TERMINAL SITE
OPTION1 - REUSE EXISTING TERMINAL BUILDING



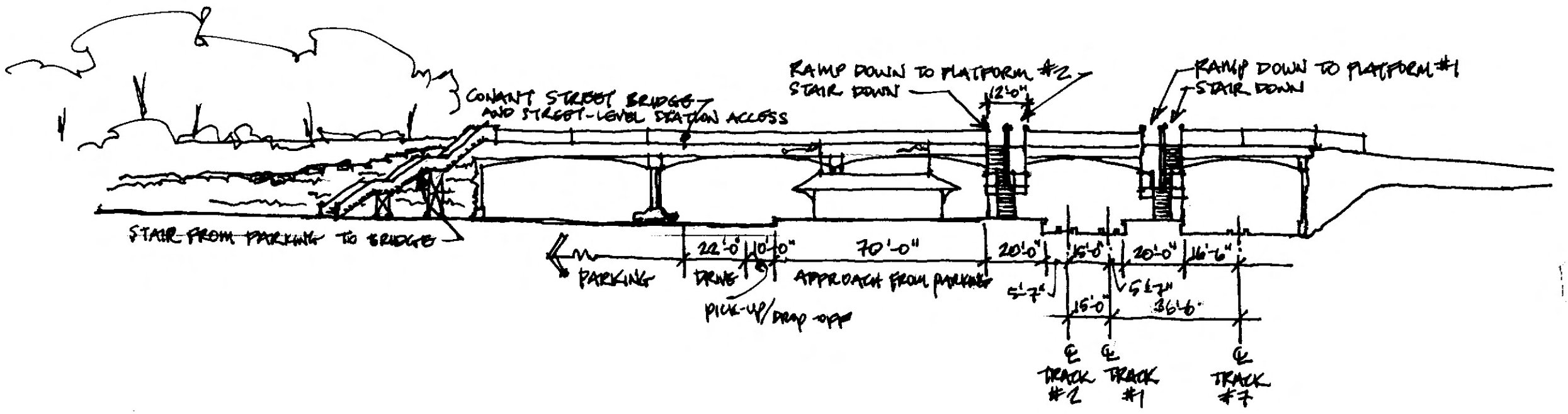
PAWTUCKET/ CENTRAL FALLS - EXISTING TERMINAL SITE
OPTION - SECTION THROUGH PLATFORMS AT TERMINAL BUILDING LOOKING NORTH



PAWTUCKET/ CENTRAL FALLS - EXISTING TERMINAL SITE
OPTION 2 - INTEGRATE TERMINAL WITH NEW PARKING STRUCTURE



PAWTUCKET/ CENTRAL FALLS - PROVIDENCE & WORCESTER RAILYARD SITE
OPTION 3 - ALTERNATE LOCATION FOR STATION



PAWTUCKET/ CENTRAL FALLS - PROVIDENCE & WORCESTER RAILYARD SITE
OPTION3 - SECTION THROUGH PLATFORMS LOOKING WEST TOWARDS CONANT STREET BRIDGE

GZA
GeoEnvironmental, Inc.

Engineers and Scientists

ASBESTOS AND HAZARDOUS MATERIALS SURVEY REPORT FORMER POST OFFICE BUILDING WORCESTER, MASSACHUSETTS

TABLE 4
ABATEMENT COST ESTIMATES

Preliminary quantity and cost estimates for asbestos abatement are provided herein for the former Post Office facility, 235 Franklin Street, Worcester, Massachusetts.

Material	Location	Quantity	Unit Cost	Cost
Chimney Flashing Cement	Roof #2	**50 SF**	**$5/SF**	$250
Flashing Felts/Cement	Roofs	3,200 SF	$5/SF	$16,000
Penetration Felts/Cement	Roofs	1,800 SF	$5/SF	$9,000
Vent Caulking	Exterior	50 LF	$8/LF	$400
Door Caulking	Exterior	180 LF	$8/LF	$1,440
Window Caulking	Exterior	3,250 LF	$8/LF	$26,000
9"x9" Floor Tiles	1st Floor	400 SF	$2/SF	$800
Linoleum/Paper Backing	1st Floor	240 SF	$2/SF	$480
Asphalt Plank/Mastic	1st Floor	13,150 SF	$5/SF	$65,750
Asphalt Sheet Flooring	1st Floor	6,600 SF	$5/SF	$33,000
Breeching Insulation	Basement	750 SF	$15/SF	$11,250
Boiler Insulation	Basement	600 SF	$15/SF	$9,000
Boiler Interior ACMs	Basement	2 Boilers	$10,000 each	$20,000
Tank Debris	Basement	100 SF	$5/SF	$500
0-6" Pipe/Fitting Insulation	Throughout	3,300 LF	$10/LF	$33,000
8-12" Pipe/Fitting Insul.	Throughout	410 LF	$15/SF	$6,150
Contaminated Carpeting	1st Floor	300 SF	$1/SF	$300
Miscellaneous ACM/Haz	Throughout	2 Man Days	$400/Day	$800
Smoke Detectors	Throughout	27 Detectors	$50/Detector	$1,350
Containerized Wastes	Basement	2 Drums	$800/Drum	$1,600
Thermostats/Switches	Throughout	25 Switches	$50/Switch	$1,250
PCB Items	Throughout	1 Dumpster	$6,000 each	$6,000
Fluorescent Light tubes	Throughout	100 Tubes	$10/Tube	$1,000
Fluorescent Light Ballasts	Throughout	50 Ballasts	$10/Ballast	$500
Boiler Soot/Ash	Basement	Unknown	$7,000 LS	$7,000
Subtotal				$252,820
10% Contingency				$25,280
Contractor Total for Abatement and Disposal				**$278,100**

SF = Square Feet, LF = Linear Feet, LS = Lump Sum

REVISIONS TO CONCEPTUAL COST ESTIMATE

PAWTUCKET/CENTRAL FALLS

November 6, 2006

URS

Job PAWTUCKET, RI Project No. 10160343 Page ____ of ____

Description COST EST. Computed by JC Date 10/25/06

Checked by DEP Date 11/3/06

Reference

OPTION 1 - REVISED

THE REVISION TO OPTION 1, 2A, & 2B INVOLVES RELOCATING THE PLATFORMS TO THE EAST SIDE OF THE TRACKS.

ALTHOUGH THIS WILL HAVE LITTLE AFFECT ON THE PLATFORM FOR TRACK 1, IT WILL HAVE SIGNIFICANT IMPACT ON THE PLATFORM FOR TRACK 2.

THE MBTA'S PREFERRED PLATFORM WIDTH IS 12'. USING THIS PLATFORM WIDTH WILL IMPACT THE EXISTING STATION AND THE EXISTING BRIDGES AT CLAY ST, JENKS ST, AND CROSS ST.

ESTIMATED COSTS OF ADDITIONAL RETAINING WALLS

FROM EXIST STATION TO CLAY ST. BRIDGE

FOR 20' WALL, UNIT COST = 925 x 1.25 = $1156/FT

COST ≈ $1156 x 100' = $115,600

FROM CLAY ST BRIDGE TO CROSS ST

FOR ~8' WALL, UNIT COST = 240 x 1.25 = $300/FT

COST ≈ 600' x $300/FT = $180,000

FROM STATION TO BARTON ST (WEST SIDE)

COST = $1156 x ~150' = $173,400

URS

Job PAWTUCKET, RI | Project No. 10160343 | Page ___ of ___ | Sheet R2 of ___

Description COST EST. | Computed by JC | Date 10/25/06

Checked by DEP | Date 11/3/06

Reference

EXIST RETAINING WALL WILL HAVE TO BE DEMO.

UNIT COST ≅ $20/FT

COST = 150' x 10' x $20/FT = $30,000

THIS WORK WILL REQUIRE AMTRAK FLAGMEN.

UNIT COST = $4000/DAY

TOTAL DAYS = 15 DAYS (DEMO) + 250/7.5 + 600/29 ≅ 70 DAYS

AMTRAK COSTS = $4000 x 70 = $280,000

TOTAL = 115,600 + 180,000 + 173,400 + 30,000 + 280,000 = $779,000

MODIFICATIONS REQ'D @ EXIST. STATION

THE EXISTING RETAINING WALL / BLDG FOUNDATION MUST BE DEMO'D AND REPLACED WITH INDIVIDUAL COLUMNS. THIS WILL ALSO REQUIRE SOME UNDERPINNING OF THE EAST WING OF THE STATION.

UNDERPIN EAST WING

ASSUME UNIT COST = $200/SF

ASSUME ½ AREA OF EAST WING.

A = ½(33 x 44) = 726 FT²

UNDERPINNING COST = $145,200

URS

Job PAWTUCKET RI | Project No. 10160343 | Page ___ of ___ | Sheet R3 of ___

Description COST. EST. | Computed by JC | Date 10/25/06

Checked by DEP | Date 11/3/06

Reference

DEMO OF EXIST WALL

DUE TO LIMITED ACCESS NEAR TRACKS, ASSUME UNIT COST FOR DEMO OF,

UNIT COST ≅ ($18.40/SF × 4' (MEANS 12" THK WALL)) (1.25 AVG THK, INFL) = $92/SF

TO ACCOUNT FOR LIMITED ACCESS AND AMTRAK FEES, USE;

UNIT COST = $150/SF

TOTAL DEMO COST ≅ (150)(45 × 20') = $135,000

REBUILD WALL WITH COLUMNS

FOOTING:

ASSUME 5 @ 6'x6'x2'

BECAUSE OF LIMITED SPACE & ACCESS, ASSUME A UNIT COST OF $1500/CY

FTG COST = 5 (6x6x2)/27 ($1500/CY) = $20,000

COLUMNS/PILASTERS

ASSUME 3'x3'x20' COLUMNS @ $2000/CY

COLUMN COST = 5[(3x3x20)/27](2000) = $66,667

URS

Job PAWTUCKET, RI | Project No. 10160343 | Page ___ of ___ | Sheet R4 of ___

Description COST EST. | Computed by JC | Date 10/25/06

Checked by DEP | Date 11/3/06

Reference

WORK IN THIS AREA WILL REQUIRE AMTRAK PERSONAL.

ASSUME AMTRAK COST ≈ $150,000

TOTAL COST

UNDERPINNING	$145,200
DEMO	135,000
FOOTING	20,000
COLUMNS	70,000
AMTRAK	150,000
	$520,200

URS

Job PAWTUCKET, RI | Project No. 10160343 | Page ____ of ____
Description ____ | Computed by JC | Date 10/25/06 | Sheet R5 of ____
Checked by DEP | Date 11/3/06 | Reference

BRIDGE REPLACEMENT

OPTIONS 1, 2A, & 2B WILL REQUIRE REPLACEMENT OF EXISTING BRIDGES AT CLAY ST, JENKS ST, AND CROSS ST. ALL BRIDGES ARE APPROXIMATELY THE SAME SIZE (SPAN x WIDTH)

DEMOLITION OVER OPERATING TRACKS WILL REQUIRE EXTENSIVE PROTECTION. ASSUME,

UNIT COST/BRIDGE ≅ $350,000

FOR NEW BRIDGE, USE:

UNIT COST = $400/SF x 1.20 (INCL. AMTRAK COSTS) = $480/SF

ASSUME NEW BRIDGES WILL BE APPROX.

40' WIDE x 120' SPAN

∴ COST/BRIDGE = $480/SF (40 x 120) = $2,304,000

TOTAL COST/BRIDGE

$2,304,000
350,000
$2,654,000

URS

Job PAWTUCKET, RI

Project No.

Page ____ of ____

Sheet R6 of ____

Description

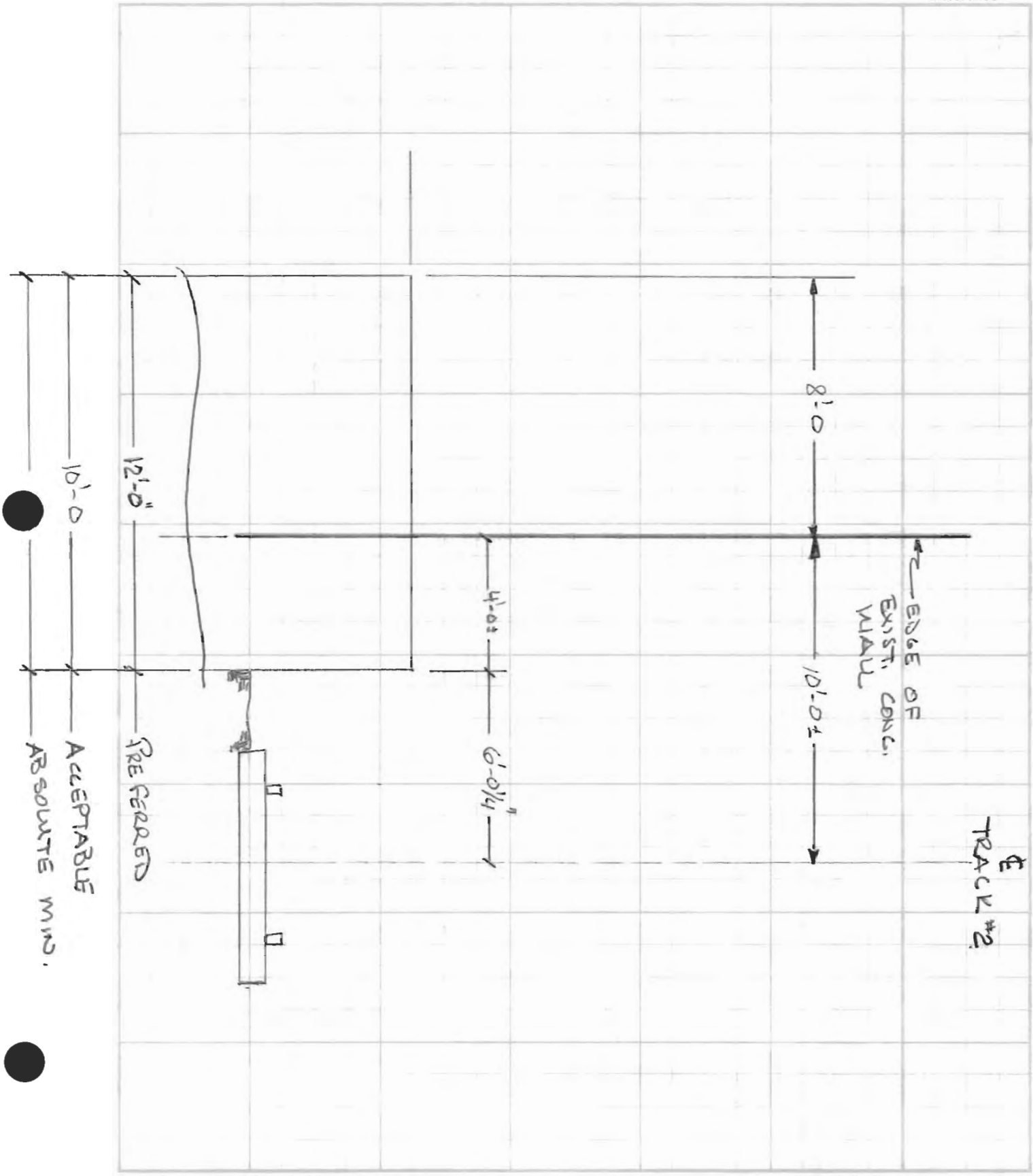
Computed by

Date 10/25/06

Checked by

Date

Reference



BACKFILL FOR COMERCIAL PADS (OPTIONS 1 & 2)

↓ DIMS SCALED FROM CONCEPT DWG

SITE 1: VOL ≅ (40' x 130' x 20') ½ (1/27) = 1926 cy

SITE 2: VOL ≅ (30' x 85' x 20') ½ (1/27) = 945 cy

SITE 3: VOL ≅ (30' x 90' x 20') ½ (1/27) = 1000 cy

3871 cy

USE: 4000 cy

FOR COMPACTED EMBANKMENT BACKFILL, USE UNIT COST OF:

($30 + $16.15)(1.25) = $57.69 SAY $58.00

↑ INFL.

↑ MEANS, PG 52

COST: (58.00)(4000) = $232,000

NOTE:

THIS COST WILL BE ADDED TO COST OF RETAINING WALLS

TOTAL RET. WALL = $779,000 + 232,000 = $1,011,000

URS

Job PAWTUCKET, RI | Project No. 10160343 | Page ____ of ____
Description COST EST | Computed by JC | Sheet R8 of ____
Checked by DEP | Date 10/25/06 | Date 11/3/06
Reference

CROSS TRACK PEDESTRIAN ACCESS - P&W SITE

ORIGINAL EST COST = $3,200,000

THIS INCLUDES 2×800' = 1600' RAISED PLATFORM PLUS PLATFORM ACCESS FROM CONNANT ST BRIDGE

FROM OPTION 1, RAISED PLATFORM COST IS APPROX.

COST = $1,920,000

∴ CROSS TRACK ACCESS COST IS APPROX.:

(3,200,000 − 1,920,000) = $1,280,000

FROM W. HAVEN PROJECT, CROSS TRACK PEDESTRIAN ACCESS COST USED:

COST: $1,403,200

∴ BREAK-OUT COST OF TRACK ACCESS FOR OPTION 3 AS:

RAISED PLATFORMS: $1,920,000

CROSS TRACK PED. ACCESS: ≈ $1,500,000

NOTE:

USE COST OF $1,000,000 FOR OPTION 2B PLATFORM ACCESS SIMILAR TO W. HAVEN.

URS Corp					
PROJECT:	Worcester - Franklin St.	SHEET NO.	1	OF	1
SUBJECT:	RR Bridge Estimate	COMP. BY:	DEP	DATE:	08/10/06
JOB NO.	10159932	CHKD BY:		DATE:	

ESTIMATE TO REPLACE P&W / CSX RR BRIDGE OVER FRANKLIN ST.

Description:

Current bridge carries 2 tracks from P & W Railroad and 4 tracks from CSX Railroad. In order to widen Franklin St., the existing bridge would have to be replaced, including both abutments.

Assumptions:

1) Based on a preliminary highway alignment placing the proposed abutments 2 feet behind the proposed back of sidewalk, the bridge span would be lengthened from 100' to a proposed 132' span.
2) New abutments would be required. Existing wingwalls could be retained and tied into the proposed abutments.
3) The existing superstructure and abutments would have to be removed (at least 1' below grade).
4) Existing railroad traffic needs to be maintained. Assume 1 track for P & W and 1-2 tracks for CSX will be maintained at all times. Additional costs due to track time delays or additional track infrastructure (ie - adding an interlocking) to maintain schedules are not included. This would require an in-depth consultation with the track owners.
5) Staged construction will be required. Assume Stage 1 - build outside P &W and CSX portions. Stage 2 - build inside P & W and CSX portions. Rail traffic will need to be shifted as needed.
6) Temporary Support of Excavation (SOE) will be required.
7) Assume $400 / SF for replacement bridge cost
8) Assume 20% of bridge cost for track work, RR coordination & RR flaggers

Estimate:

Proposed Bridge Replacement
132' span x 318' wide = 41976 SF

41976 SF x $400 / SF =		$16,790,400
RR track work, coordination & flaggers (20 %)		$3,358,080
Contingency (10 %)		$2,014,848
	TOTAL	**$22,170,000**

"Neil Levitt"
<nlevitt@dhkinc.com>
10/19/2006 10:44 AM

To <Jack_Cash@URSCorp.com>,
<doug_peterson@urscorp.com>
cc "Mickey Krockmalnic" <mkrockmalnic@dhkinc.com>
bcc
Subject Revised Option 1

Jack,

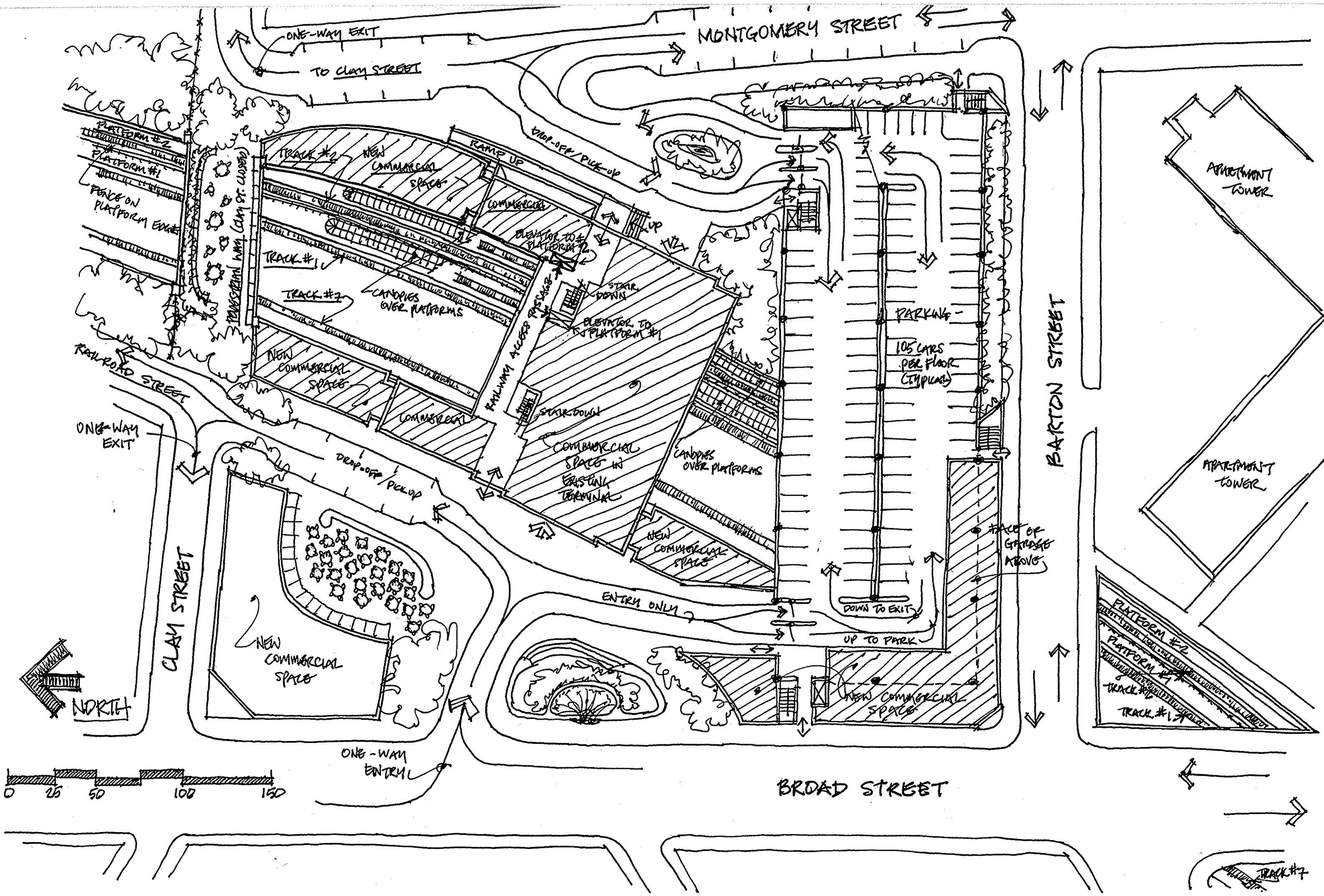
I was supposed to speak with you yesterday evening, but didn't get a chance to call. Now I am rushing out the door. However, attached is a copy of the revised Option 1 plan for the existing terminal site.

The three major changes are:

- The platforms have been switched to the opposite sides of tracks 1 and 2.
- The elevator to the east has been moved about 3'-4"further to the east then its current position.
- The retaining wall under the station on the east side has been demolished and moved to a position underneath the column row above/coinciding with the exterior wall of the east wing and aligned with the station/column line, i.e., not parallel to its current position. This means it moved east about 1.3' at the south end and about 5.4' at the north end (making an fully adequate platform for Track 2.

I will be out for the rest of the day. Probably in the office tomorrow morning until about 10:30. Then back on Monday AM, when I will be able to send you a sketch for the new Option 2.

Neil Levitt REV'D.--Opt. 1_Reuse Exist Terminal.pdf


MONTGOMERY STREET
ONE-WAY EXIT
TO CLAY STREET
PLATFORM #2
PLATFORM #1
FENCE ON PLATFORM EDGE
TRACK #2
NEW COMMERCIAL SPACE
RAMP UP
DROP-OFF / PICK-UP
UP
COMMERCIAL
ELEVATOR TO # PLATFORM #2
TRACK #1
TRACK #3
CANOPIES OVER PLATFORMS
STAIR DOWN
ELEVATOR TO PLATFORM #1
RAILWAY ACCESS PASSAGE
PARKING
105 CARS PER FLOOR (TYPICAL)
BARTON STREET
APARTMENT TOWER
RAILROAD STREET
ONE-WAY EXIT
DROP-OFF / PICK-UP
COMMERCIAL SPACE IN EXISTING TERMINAL
CANOPIES OVER PLATFORMS
NEW COMMERCIAL SPACE
FACE OF GARAGE ABOVE
CLAY STREET
ENTRY ONLY
DOWN TO EXIT
UP TO PARK
NEW COMMERCIAL SPACE
NEW COMMERCIAL SPACE
NORTH
ONE-WAY ENTRY
0 25 50 100 150
BROAD STREET
PLATFORM #2
PLATFORM #1
TRACK #2
TRACK #1
TRACK #3

"Mickey Krockmalnic "
<mkrockmalnic @dhkinc.com
>

10/24/2006 11:10 AM

To <Jack_Cash@URSCorp.com>,
<doug_peterson@urscorp.com>
cc "Neil Levitt" <nlevitt@dhkinc.com>
bcc
Subject FW: PDF Pawtucket - Option 2

Jack/Doug,

I send this in Neil's name (had to rush to a mtg. in Conn.). It is Option 2, showing a new bridge from which stairs and elevators lead down to platforms. Garage is the same. The relocation of the retaining wall (see dotted line) - still necessary.

Mickey

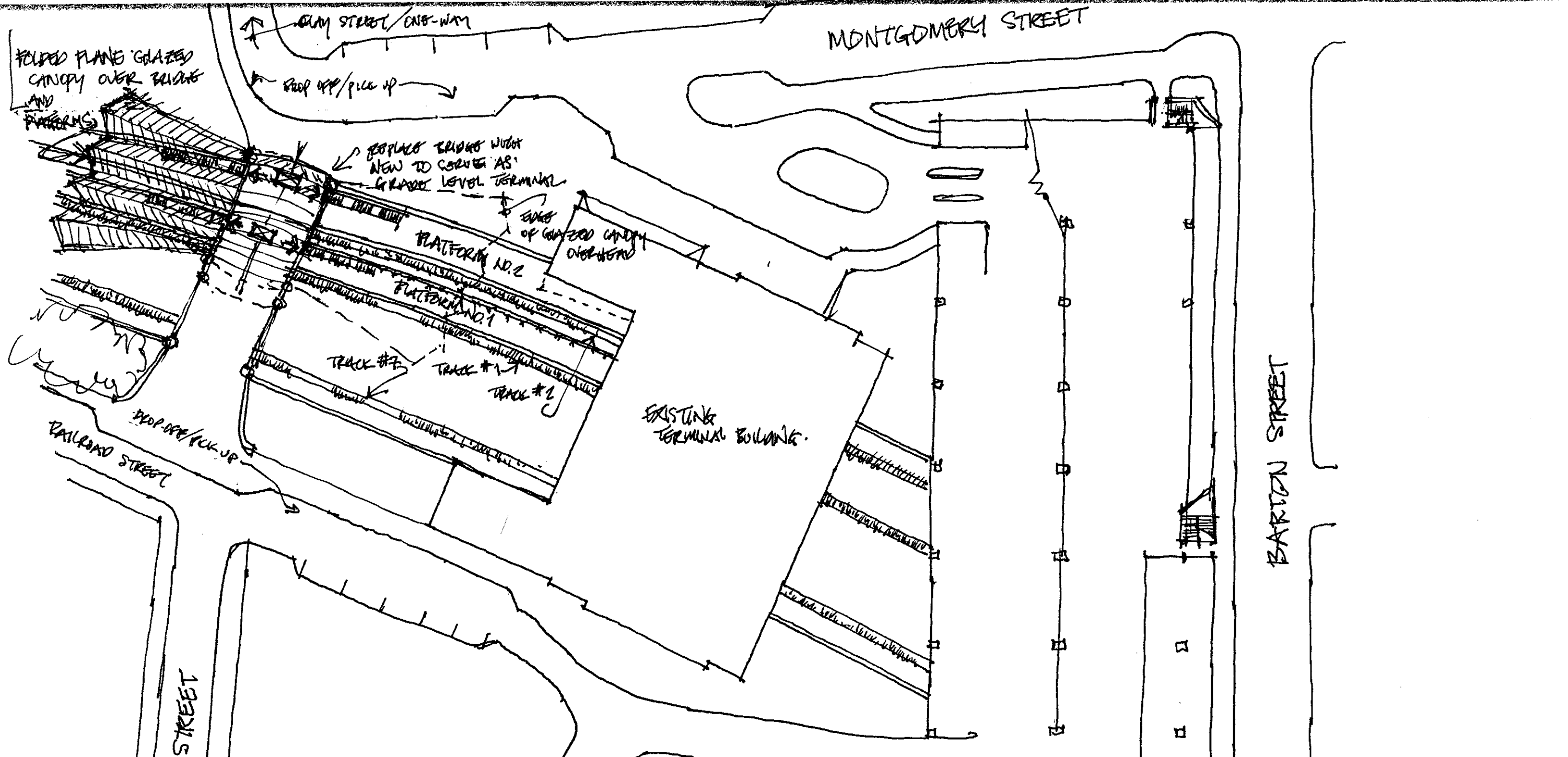
RECOMMENDS STARTING PLATFORM #2 @ END OF BLDG EAST WING TO AVOID MODIFYING BLDG SUPPORT

From: Allen Trombley
Sent: Tuesday, October 24, 2006 11:03 AM
To: Mickey Krockmalnic
Subject: PDF

Mickey,

As requested.

Allen AMK PDF.pdf


CLAY STREET / ONE-WAY
DROP OFF/PICK UP
FOLDED PLANE GLAZED CANOPY OVER BRIDGE AND PLATFORMS
REPLACE BRIDGE WITH NEW TO CONNECT AT GRADE LEVEL TERMINAL
EDGE OF GLAZED CANOPY OVERHEAD
PLATFORM NO. 2
PLATFORM NO. 1
TRACK #3
TRACK #1
TRACK #2
EXISTING TERMINAL BUILDING.
DROP-OFF/PICK-UP
RAILROAD STREET
MONTGOMERY STREET
BARTON STREET
CLAY STREET
NORTH
0
25
50
100
150
BROAD STREET

VHB Comments - 10/4/06

URS

OPTION 1 - PAWTUCKET/CENTRAL FALLS COST ESTIMATE - REUSE EXISTING STATION

PROJECT NO.: 10160343

Prepared By: J. Cash Date: 9/29/2006
Checked By: D. Peterson Date: 9/29/2006

Item No./ Specification Section	DESCRIPTION	QTY	UNIT	UNIT COST	SUB-TOTAL COST	TOTAL COST
1	Renovate Existing Station Structure	34,380	SF	$ 175	$ 6,016,500	$ 6,016,500
	Includes:					
	External renovation of building envelope					
	Interior renovation of building finishes					
	Renovation of building utilities					
2	Structural Strengthening of Building	1	Lump Sum	$ 1,800,000	$ 1,800,000	$ 1,800,000
	Includes:					
	Repair of Building Support Girders Over Tracks					
	Repair of Building Floor Slabs					
3	New Parking Garage	115,200	SF	$ 85	$ 9,792,000	$ 9,792,000
	(3 Levels / 315 Cars)					
4	New Train Platforms	1,600	FT	$ 1,200	$ 1,920,000	$ 1,920,000
	2@ 800 Ft. ea w/ Canopies)					
5	Relocate Catenary Supports	25	EA	$ 43,100	$ 1,120,600	$ 1,120,600
6	Track Signals and Communication	1	Lump Sum	$ 125,000	$ 125,000	$ 125,000
	Includes:					
	High Speed Train Passenger Warning System					
7	Civil	1	Lump Sum	$ 1,970,000	$ 1,970,000	$ 1,970,000
	Includes:					
	Street Work					
	Sidewalks					
	Utilities / ~~Drainage~~					
	Landscaping					
	Parking Lot (surface)					
	Other...					
				Sub-Total Cost	$	22,744,100
				Add: 50% Contingency	$	11,372,050
				TOTAL COST:	$	34,117,000

CONTING. & DESIGN COST INCLUDED IN $1,970,000. (50% TOTAL)

Assumptions:

1. Land acquisition costs not included
2. Parking garage has 3 levels and 315 parking spaces
3. Does not include commercial development costs

1. PLATFORM COST SEEMS LOW FOR 800' HI-LEVEL PLATF. : $1M to $1.2M each #2 - 2.4M USED IN NB-FR
2. WORK ASSOC WITH COMMERCIAL PAD PREP.
3. TRACK WORK?
4. RETAINING WALLS/FNDN FOR 2 COMMERCIAL BLDG

URS

OPTION 2A - PAWTUCKET/CENTRAL FALLS COST ESTIMATE - NEW STATION

PROJECT NO.: 10160343

Prepared By: J. Cash Date: 9/29/2006
Checked By: D. Peterson Date: 9/29/2006

Item No./ Specification Section	DESCRIPTION	QTY	UNIT	UNIT COST	SUB-TOTAL COST	TOTAL COST
1	New Station Structure	34,380	SF	$ 250	$ 8,595,000	$ 8,595,000
2	Demolition of Existing Station	1	Lump Sum	$ 1,100,000	$ 1,100,000	$ 1,100,000
3	New Parking Garage (3 levels / 315 Cars)	115,200	SF	$ 85	$ 9,792,000	$ 9,792,000
4	New Train Platforms 2@ 800 Ft. ea	1,600	FT	$ 1,200	$ 1,920,000	$ 1,920,000
5	Relocate Catenary Supports	26	EA	$ 43,100	$ 1,120,600	$ 1,120,600
6	Track Signals and Communication Includes: High Speed Train Passenger Warning System	1	Lump Sum	$ 125,000	$ 125,000	$ 125,000
7	Civil Includes: Street Work Sidewalks Utilities Landscaping	1	Lump Sum	$ 1,970,000	$ 1,970,000	$ 1,970,000
					Sub-Total Cost	$ 24,622,600
				Add:	50% Contingency	$ 12,311,300
					TOTAL COST:	$ 36,934,000

Assumptions:

1. Land acquisition costs not included
2. Parking garage has 3 levels and 315 parking spaces
3. Does not include commercial development costs
4. New station has same SF floor area.

- MOBILIZATION
- FLAGGING COSTS PLATFORMS
- RR INSUR PREMIUMS
- HAZ MAT COST
- AMTRAK DELAY / PERMIT COSTS
- FINAL DESIGN COSTS / PERMITTING
- OFFSITE / ENTRANCE TRAFFIC IMPV
- CONANT ST BRIDGE UPGRADES / MODIF
- ESCALATION TO BUILD YEAR

URS

OPTION 2B - PAWTUCKET/CENTRAL FALLS COST ESTIMATE - EXISTING STATION NOT USED

PROJECT NO.: 10160343

Prepared By: J. Cash Date: 9/29/2006
Checked By: D. Peterson Date: 9/29/2006

Item No./ Specification Section	DESCRIPTION	QTY	UNIT	UNIT COST	SUB-TOTAL COST	TOTAL COST
1	New Parking Garage (3 Levels / 390 Cars)	123,510	SF	$ 85	$ 10,498,350	$ 10,498,350
2	New Train Platforms 2@ 800 Ft. ea	1,600	LF	$ 1,200	$ 1,920,000	$ 1,920,000
3	Relocate Catenary Supports	26	EA	$ 43,100	$ 1,120,600	$ 1,120,600
4	Track Signals and Communication Includes: High Speed Train Passenger Warning System	1	Lump Sum	$ 125,000	$ 125,000	$ 125,000
5	Civil Includes: Street Work Sidewalks Utilities Landscaping	1	Lump Sum	$ 1,850,000	$ 1,850,000	$ 1,850,000
					Sub-Total Cost	$ 15,513,950
				Add:	50% Contingency	$ 7,756,975
					TOTAL COST:	**$ 23,271,000**

Assumptions:

1. Land acquisition costs not included
2. Parking garage has 3 levels and 390 parking spaces
3. Does not include commercial development costs

Parking Lot $ included in both!

URS

OPTION 3 - PAWTUCKET/CENTRAL FALLS COST ESTIMATE - P&W SITE

PROJECT NO.: 10160343

Prepared By: J. Cash Date: 9/29/2006
Checked By: D. Peterson Date: 9/29/2006

Item No./ Specification Section	DESCRIPTION	QTY	UNIT	UNIT COST	SUB-TOTAL COST	TOTAL COST
1	New Parking Lot (250 Cars)	1	Lump Sum	$ 750,000	$ 750,000	$ 750,000
2	New Train Platforms 2@ 800 Ft ea W/ Canopies	1,600	FT	$ 2,000	$ 3,200,000	$ 3,200,000
3	Relocate Catenary Supports	26	EA	$ 43,100	$ 1,120,600	$ 1,120,600
4	Track Signals and Communication Includes: High Speed Train Passenger Warning System Relocate Signal	1	Lump Sum	$ 875,000	$ 875,000	$ 875,000
5	Civil Includes: Street Work Sidewalks Utilities Landscaping	1	Lump Sum	$ 2,900,000	$ 2,900,000	$ 2,900,000
					Sub-Total Cost	$ 8,845,600
				Add:	50% Contingency	$ 4,422,800
					TOTAL COST:	$ 13,269,000

Assumptions:

1. Land acquisition costs not included

2. Conant Street Bridge will be modified to allow pedestrians to cross over the tracks between the parking lot and the platforms

3. New (relocated) P&W Yard Cost NOT INCLUDED.

.. STAIRS & RAMPS FROM BRIDGE MAY REQUIRE @ CONANT ST MODIF/IMPROVEMENTS

URS

Page ____ of ____

Job _____ Project No. _____ Sheet ____ of ____

Description _____ Computed by DEP Date 10/4/06

_____ Checked by _____ Date _____

Reference

PAWTUCKET - TASK 3A COORDINATION MTG

REVIEW OF CONCEPT PLANS

- P&W RAIL YARD SITE
  - Need to relocate RR Signal within platform

- HISTORIC SITE (OPTIONS 1, 2A & 2B)
  - GAP ISSUE - 13½" - TOO BIG
  - CAN WE SWITCH PLATFORMS TO BE ON OUTSIDE
    - GAP DUE TO TRAIN/DOORS IS ELIMINATED
    - " " " SUPERELEVATION " "
  - DHK WILL REVISE CONCEPTS
  - WILL REQUIRE ~~RETAIN~~ RETAIN WALL & BRIDGE MOD'S TO NORTH ON TRACK 1, 2

- ESTIMATE
  - Add changes to options 1, 2A + 2B
  - Revise per UHB Comments

SCHEDULE

- Meet Again on OCT 25th - 1:30PM
- HAVE Revisions Completed by Oct ~~28~~ 27th

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URS

Job PAWTUCKET, RI | Project No. | Page ___ of ___
Description REVISED OPTIONS #1-3 | Computed by JC | Date 5/25/07 | Sheet 1 of ___
Checked by DEP | Date 5/29/07 | Reference

REVISED OPTIONS - OPT #1

NOTE: FOR REF, SEE W. HAVEN, CT EST.

PLATFORM ACCESS

JENKS ST BRIDGE (2-STAIRS, 2-ELEVATORS)

2-STAIRS
2-ELEVATORS
USE BRIDGE FOR CROSS TRACK ACCESS

W. HAVEN :	$ 1,500,000
LESS: CROSS TRACK ACCESS:	350,000
	$ 1,150,000

CROSS ST BRIDGE (2-STAIRS OFF BRIDGE)

W. HAVEN :	$ 1,500,000
LESS: CROSS TRACK :	- 350,000
LESS: 2-ELEVATORS :	- 500,000
	$ 650,000

CENTRAL/PACIFIC (X-TRACK ACCESS, 2-STAIRS)

W. HAVEN	$ 1,500,000
LESS: 2-ELEVATORS	-500,000
	$ 1,000,000

TOTAL ≈ $ 2.8 mil ←

ALSO;

800' x 2 = 1600 FT PLATFORM = 1600 x $ 1200/FT = $ 1.92 mil

URS

Job PAWTUCKET, RI | Project No. | Page ____ of ____
Description REVISED OPTS #1-3 | Computed by JC | Date 5/25/07 | Sheet 2 of ____
Checked by DEP | Date 5/29/07 | Reference

OPTION #2

- EXTEND BOTH PLATFORMS ~500' FOR ACCESS TO EXIST. STATION

	$
FROM OPT #1:	1,920,000
(1000') ($1200/FT):	1,200,000
	$3,120,000

	$	$
3 BRIDGES @	2,654,000	= 7,962,000
RETAINING WALLS:		1,191,000
EAST WING OF BLDG:		520,200
		$9,673,200

URS

Job PAWTUCKET, RI | Project No. | Page ___ of ___
Description REVISED OPTS #1-3 | Computed by JC | Date 5/25/07 | Sheet 3 of ___
Checked by DEP | Date 5/29/07 | Reference

OPTION #3

* ADD BLDG RENOVATION

	$
BLDG RENOVATION:	6,016,500
STRUCTURAL STRENGTHENING:	1,800,000
* LESS ACCESS @ CLAY ST	~ 1,000,000
	$6,816,500.

* PER DAVID WILCOCK, VHB, FOR OPTION #3, ACCESS WILL BE THROUGH STATION BUILDING. ACCESS @ CLAY ST WILL BE REMOVED.

"Wilcock, David"
<DWilcock@VHB.com>
05/25/2007 01:29 PM

To <Doug_Peterson@URSCorp.com>,
<Jack_Cash@URSCorp.com>
cc "Anne Galbraith" <agalbraith@cox.net>
bcc
Subject PCF Costs

Doug:

I am glad I called you this afternoon about the costs. Your suggestions actually helped me create a third cost scenario to present on Tuesday.

As we discussed, would you please check my numbers to make sure I am not missing something or mis-representing the estimate. My assumptions regarding the three options (attached) are as follows:

Option 1
Platforms – 800 feet long; Jenks St to Pacific Street
Access – one full access at Jenks (Elevators, stairs) and one or two stairs only access points at Cross/Central and Pacific
Bridge and Wall – two bridges (Jenks/Cross); kept the full wall cost — COST
RR Mods – Reduced number of catenary poles; keeping a floating contingency for other RR work (i.e. crossovers)
Other – Site/civil, parking, and more RR contingency (for strategic purposes)

Option 2
Platforms – add 500 foot of access walkway to both platforms to reach building — stairs only
Access – Full access at Clay Street (not in RR building); Jenks/Cross; Central/Pacific
Bridge and Wall – all three bridges; new retaining wall; modified wall at station
RR mods – full catenary pole cost plus RR contingency
Other – Same as above

Option 3
Renovate Building – took out $1m for access cost included in Option 2; added Structural Strengthening costs — ? — Eliminate access @ CLAY ST.
Garage – As presented

Please let me know if these numbers look okay. An answer early Tuesday morning would be appreciated (the meeting is at 3:30 that afternoon). I know the bottom line of Option 3 is higher than your estimate but it includes the floating RR contingency (with 50% contingency added). We can follow-up with the revised backup next week.

Thanks,
David

David C. Wilcock, PE
Manager, Planning & Operations
Transit & Rail Services
VHB/Vanasse Hangen Brustlin, Inc.
99 High Street, 10th Floor
Boston, MA 02110-2354
Tel: (617) 728-7777 x2935
Direct Dial: (617) 607-2935
Mobile: (617) 875-8844
Fax: (617) 728-7782
e-mail: dwilcock@vhb.com
www.vhb.com

PAWTUCKET/CENTRAL FALLS *Commuter Rail Facility*

Concept Design – Capital Costs: Option 1

Platforms	$2.0 million
Platform Access (3 Locations)	$2.0 → 2,8
Bridge Modifications and Retaining Walls	$6.5
Railroad Modifications	$3.0
Other	$2.0
SUB-TOTAL	$15.5 million
Concept Contingencies and Add-Ons	$7.75
TOTAL	$23.25 million

VHB *Vanasse Hangen Brustlin, Inc.*

Concept Design – Capital Costs: Option 2

Platforms (Includes 500' Access Walk)	$3.2 million
Platform Access (3 Locations)	$2.0 2.8
Bridge Modifications and Retaining Walls	$9.7
Railroad Modifications	$3.5
Other	$2.0
SUB-TOTAL	$20.4 million
Concept Contingencies and Add-Ons	$10.2
TOTAL	$30.6 million

Concept Design – Capital Costs: Option 3

Renovate Building	$6.8 million
Parking Garage	$17.0
Other	$1.0
SUB-TOTAL	$24.8 million
Concept Contingencies and Add-Ons	$12.4
TOTAL	$37.2 million
Capital Costs: Option 2	$30.6
TOTAL	$67.8 million

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F

Appendix F: Supplemental Figures

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0 50 100 Feet

Pawtucket/Central Falls Commuter Rail Facility
Feasibility Study and Site Analysis

Figure F-1

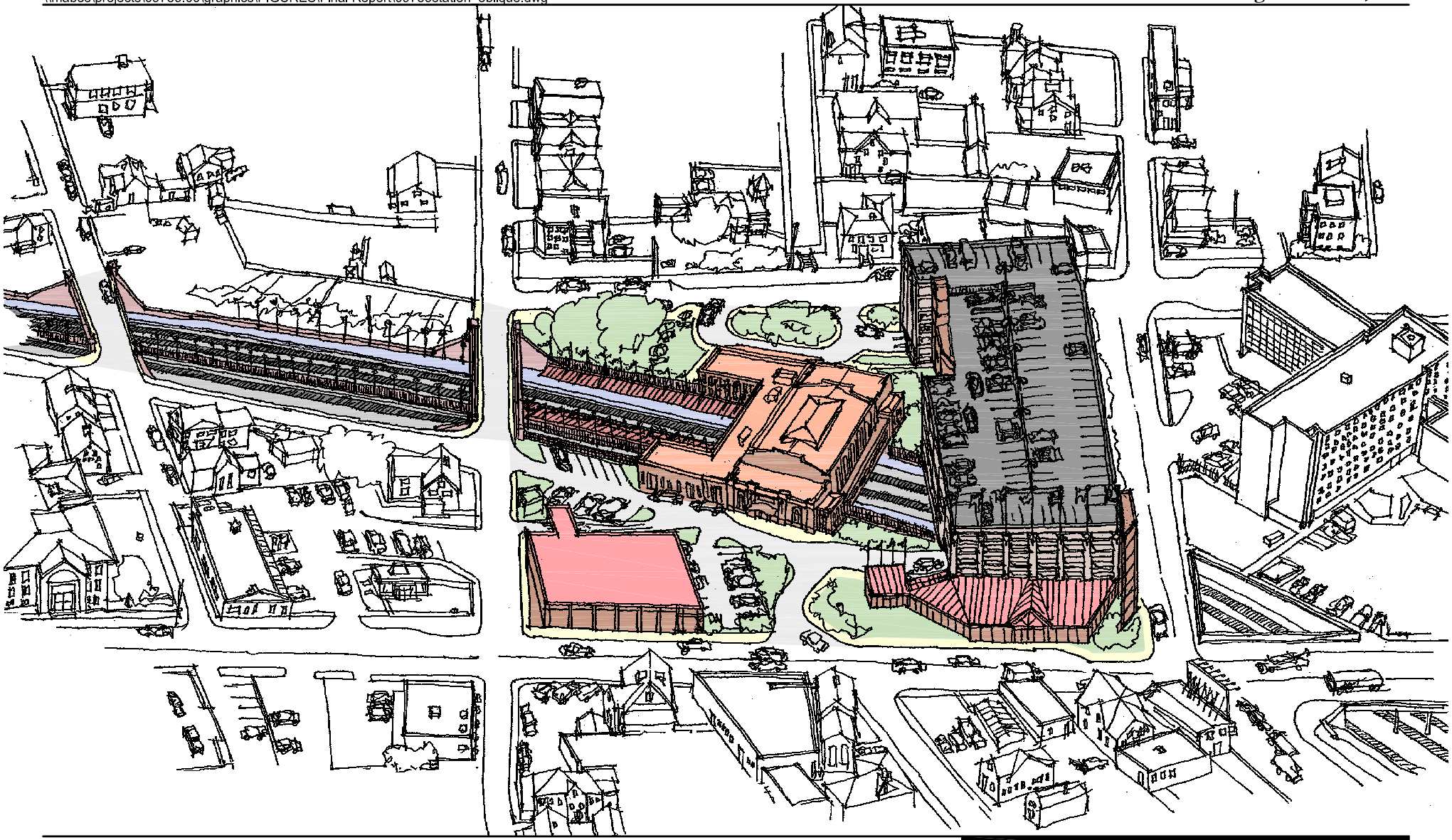
Jenks Street Option
Plan View
800 Foot High-Level Platforms
No Platform Access at Former Station Building

0 50 100 Feet

Pawtucket/Central Falls Commuter Rail Facility
Feasibility Study and Site Analysis

Figure F-2

Clay Street Option and Station Development Option
Plan View
800 Foot High-Level Platforms with
500 Foot Platform Extension to Former Station Building



Pawtucket/Central Falls Commuter Rail Facility
Feasibility Study and Site Analysis

Figure F-3

Pawtucket/Central Falls
Commuter Rail Stop
Preferred Site Concept
Station Development Option Oblique View

G

Appendix G: Noise and Vibration Analysis

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Noise and Vibration Evaluation

A preliminary assessment was conducted of the existing noise and vibration environment and the potential effects of reinstituting passenger service at the historic train station (Station), focusing on the area immediately surrounding the proposed Station site in Pawtucket and Central Falls, Rhode Island.

Noise and Vibration Analysis

The area surrounding the proposed Station site features a mixed-use and densely populated urban neighborhood that is split between the cities of Pawtucket and Central Falls in Rhode Island. The predominant land uses in immediate proximity to the Station site are residential, commercial, and business-professional. The nearby residences, considered by the Federal Transit Administration as Category 2 noise-sensitive use are potentially affected by project-related noise and the Station building itself is potentially affected by project-related construction vibration.

While other noise-sensitive uses are in the general area of the Station, they are beyond the zone of potential noise or vibration effects of the project, with the closest school located one block northwest of the proposed Station site. There are three parks each several blocks away from the site: Jenks, Slater, and Wilkinson. In addition, 18 churches are within half a mile of the project site, including New City Church, located one block south and Holy Cross, located one block east.

■

Existing Noise and Vibration Environment

During a site visit and walk-a-round survey conducted on March 10, 2006, the existing ambient noise and vibration conditions were subjectively evaluated by a noise and vibration control engineer who is certified in Transit Noise and Vibration Impact Assessment. Additionally, three short-term sound measurements were performed around the perimeter of the existing Station building during approximately 8:00 am to 9:30 am. The Station site was

isolated by chain-link fencing and was not in use during the measurements. Thus, all measured environmental noise was due to local community activity, dominated by pedestrian activity and traffic on the adjacent, surrounding streets. The measured equivalent sound level (L_{eq}) varied from 58 to 64 dBA L_{eq}, with a variability between the L_{eq} and the statistical mean sound level (L_{50}) that is consistent with measurement of intermittent traffic and pedestrian noise. The measured sound level range from the high 50's to low 60's dBA is also consistent with the acoustician's subjective evaluation of the noise environment and that of a typical urban setting. Based on the usual reduction of noise during the nighttime hours (typically 7-10 dBA L_{eq}) the estimated L_{dn} for the area surrounding the site is 61 to 63 dBA.

Project Noise and Vibration

The FTA has published a detailed methodology for determining the potential for significant environmental impacts from project-related noise and/or vibration.[1] This study will utilize the "screening" and "general" methods of analysis. The FTA provides a very generalized and conservative table of "Screening Distances for Noise Assessments" that are based on the subcomponent of a transit project, in this case a commuter rail station. Screening distances are considered thresholds for a high likelihood of either "no impact" or "take a closer look". The screening distances for a "commuter rail station" are 450 feet from a station that has an "unobstructed" view to surrounding uses and 225 feet where there are "intervening buildings". Because the proposed project Station has some atypical features, such as passenger platforms and tracks in-cut below-grade, and concentrated parking in a vertical seven-floor structure it doesn't obviously fit either basic screening distance. Thus, a preliminary general noise assessment was performed. The primary noise source of the proposed Station is the multi-story parking structure and attendant motor vehicle activity plus some local transit bus activity in front of the Station. The Cadna A® noise model was used to estimate the potential noise from the project. Based on the traffic analysis for the project (provided by Gordon R. Archibald, Inc.) and preliminary site plan (provided by URS, Boston), the increase in peak-noise-hour sound levels are approximately:

- <1 dBA to 2 dBA on Clay, Barton, and Broad Streets,
- 6 dBA along Montgomery Street, and
- the overall L_{dn} generated by the project would be 55 to 58 dBA. This project L_{dn} is less than the existing L_{dn} ,

[1] FTA, US Department of Transportation, May 2006. Federal Transit Administration, Transit Noise and Vibration Impact Assessment Manual, FTA-VA-90-1003-06.

- the existing community noise plus project noise would result in a future L_{dn} range of 62 to just under 65 dBA. This range of increase over the existing L_{dn} results in No Impact according to the FTA criteria for noise impact.[2]

Short-Term Noise and Vibration Impacts

Noise and vibration related to construction would result from the operation of heavy equipment needed to construct the project. Local ordinances generally regulate noise and the contractor will be required to adhere to any applicable regulations of Central Falls and Pawtucket.
Noise produced by construction equipment working on this project would occur with varying intensity and duration during eight basic phases of construction. Overall project construction is estimated to require approximately 18 months.

Noise from construction activity is generated by the broad array of powered, noise-producing mechanical equipment used in the construction process. This equipment ranges from hand-held pneumatic tools to bulldozers, dump trucks, and front loaders. The exact complement of noise-producing equipment that would be in use at a given construction site during any particular period is difficult to predict. However, the maximum noise levels from construction activity during various phases of a typical construction project have been evaluated, and their use is believed to yield an acceptable prediction of a project's potential noise impacts. Therefore, except for special activities, such as pile driving, the evaluation of project construction noise impacts that would occur during the project is based on typical noise level (L_{eq}) ranges for industrial construction sites as shown in Table G-1 for various construction phases, where all pertinent equipment is present and operating.

Table G-1. Construction Activity Noise Levels
(L_{eq} at 50 feet reference distance)

Ground Clearing	84±6 dBA
Excavation	89±7 dBA
Foundations	78±3 dBA
Erection	85±7 dBA
Finishing	89±6 dBA

Source: U.S. Environmental Protection Agency, 1971

[2] Ibid. Chapter 3.

Because of vehicle technology improvements and more-strict noise regulations enacted for licensed vehicles since 1971, this analysis will use the midpoint noise level shown above. This information indicates that the overall noise level generated on a construction site could reach a maximum short-term noise level of 89 dBA at a distance of 50 feet. Noisy construction activities could be in progress on more than one part of the project site at a given time, although it is unlikely that noise levels on two separate construction areas would peak simultaneously. The magnitude of construction noise levels varies over time because construction activity is intermittent and power demands on construction equipment are cyclical. Because of this cycling, the average L_{eq} would be about 3 dBA lower than the 89 dBA maximum noise levels. A conservative estimate of maximum sustained construction noise levels would be 86 dBA at 50 feet.
Noise levels generated by construction equipment (or by any “point source”) decrease at a rate of approximately 6 decibels (dB) per doubling of distance away from the source (Diehl, 1973). Therefore, at a distance of 100 feet the noise levels will be about 6 dB lower than at the 50-foot reference distance. Similarly, at a distance of 200 feet the noise levels would be approximately 12 dBA lower than at the 50-foot reference distance. Typically, construction noise will occur between the hours of 7:00 am and 6:00 pm. Construction noise after these hours would likely require a variance to local noise regulations.

Construction vibration impacts could result from activities such as pavement breaking, jackhammer use and pile driving conducted in proximity to very sensitive structures. There would be no structural vibration impact to off-site buildings and no vibration annoyance if these activities are not conducted during evening and nighttime hours. Mitigation of construction impacts may require use of alternative construction techniques, restriction of hours of vibration-producing construction activity or both.

Table G-2 identifies the vibration source levels for construction equipment at 25 feet. This construction activity vibration is generally intermittent and temporary and, therefore, does not result in a significant impact to receivers with the exception of properties located within 25 feet of the activity.
The following formula was used to estimate the propagation of vibration to nearby receivers:

$$\text{PPV equip} = \text{PPV ref} \times (25/D)^{1.5}$$

where PPV (equip) is the peak particle velocity in inches/sec of the equipment, adjusted for distance; PPV (ref) is the reference vibration level in inches/sec at 25 feet from Table G-2; and D is the distance from the equipment to the receiver in feet.

Table G-2 Vibration Source Levels for Construction Equipment (From Measured Data)

Equipment	Peak Particle Velocity (PPV) at 25 ft (in/sec)	Approximate Vibration Level (VdB) at 25 ft
Pile Driver (impact)	1.518	112
Large bulldozer	0.089	87
Caisson drilling	0.089	87
Loaded trucks	0.076	86
Jackhammer	0.035	79
Small bulldozer	0.003	58

Source: Transit Noise & Vibration Impact Assessment, Federal Transit Administration, May 2006.

Using this formula, propagation distances were computed based on a vibration damage threshold criterion of 0.20 in/sec (approximately 100 VdB) for fragile buildings or 0.12 in/sec (approximately 95 VdB) for extremely fragile historic buildings. The calculated propagation distances for a pile driver, which produces the most vibration, are 27 feet for fragile buildings and 28 feet for extremely fragile historic buildings. These distances indicate that any fragile, or extremely fragile historic buildings located this close to pile driving, would have a probable impact from resulting vibration emitted during construction activities. If pile driving is necessary to construct the project then care should be taken to protect and avoid any damage to the existing historic train Station building. Standard construction is not expected to be affected by construction vibration.

Positive and Negative Impacts of a New Commuter Rail Stop

The primary difference between the existing environmental noise conditions surrounding the project site and the future-with-project noise conditions would be the increased surface street vehicular traffic and its associated noise. Minor secondary noise emissions include Station platform public address announcements and the “train approaching” warning signal. Both of these sources would be located at the existing track elevation that is in a trench and below the grade of the surrounding uses. Based on its size and location, the new parking structure is likely to provide some shielding of traffic noise from Broad Street that now affects residences on Montgomery Street. There would be no differences in vibration levels between existing and future-with-project conditions.

Potential operational impacts, both positive and negative from the new commuter rail stop are summarized below.

Positive impacts include:

- Potential reduction in Broad Street traffic noise affecting portions of Montgomery Street

- Potential for reduced vehicle congestion may provide a slight noise benefit due to less vehicle braking and acceleration and potentially less horn blowing.

Negative, non-significant impacts include:

- Perceptible but not significant traffic noise increases in the morning and afternoon peak-two-hour traffic periods, with small, likely not perceptible changes during the off-peak hours throughout the remainder of the operational activity period of the train Station (5:00AM to Midnight).

- Possibly audible but minor additional noise from platform paging system and train approaching signals.

- Noise from temporary construction activities.

- Slight with-project noise increases above the existing L_{dn} that result in "No Impact" according to the FTA criteria for impact.

- On-site vibration from temporary construction activities (see discussion below).

The only potential vibration impact associated with the project might arise from high-vibration construction activities such as pavement breaking, vibratory soil compaction, and pile driving. Because of the site configuration and the distance to surrounding use structures, it is not likely for any construction vibration impacts to occur off-site. However, these and any other high vibration construction activities conducted in proximity to the existing train Station building should be carefully planned and conducted to preclude damage to this historic structure.

Recommended Design Considerations

Because the project will not cause significant impacts there are no required noise mitigation measures. However, project design considerations and operational actions to minimize noise generation and annoyance to adjacent noise-sensitive use are appropriate. For example, mechanical equipment such as heat pumps, condensers and ventilation fans should be specified and/or located and/or shielded to minimize noise emission toward residential uses. Locate any large refuse bin unloading area on the noisier (Broad Street) or less sensitive (Clay Street) sides of the project. The platform public address system and "approaching train" warning signal should be designed for minimum effective sound levels and loudspeakers oriented to focus sound only on the platform area and minimize direct and reflected sound emission in any other directions. The parking structure should consider design features that minimize or avoid typical parking structure noise (car door slams, engine

starts, tire squeal, etc.) propagating toward Montgomery or Barton Streets. If necessary, project traffic on the more noise-sensitive streets might be minimized by time-of-day control of specific parking entrances and/or exits.

The use of best practices for project construction noise control is recommended. Typical best practices are provided in the Appendix.

Indirect, Cumulative, and Unavoidable Impacts

Indirect adverse impacts are not anticipated to result from the project.

The project, when combined with other present and reasonably foreseeable future projects in the immediate vicinity of the train Station having contemporaneous construction and operations could cause adverse cumulative noise impacts.

The train Station project would not create unavoidable adverse environmental noise or vibration impacts.

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